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Isolating Student, School, and Community Effects on School Weapon Carrying

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ABSTRACT

Much prior research has alluded to the importance of community conditions in shaping levels of violence in around and schools. It is interesting to find, therefore, that few studies have systematically examined the effects of broader contextual characteristics (e.g., economic disadvantage) on levels of student misbehavior in schools. This research filled a part of this void in the school violence literature by using data from the National Longitudinal Study of Adolescent Health to identify whether social conditions in schools' attendance areas were statistically related to levels of student weapon carrying across a national sample of 55 high schools.

Multilevel models estimated in this research revealed that levels of economic disadvantage, residential mobility, and violent crime in schools' attendance areas were unrelated to between-school variation in student weapon carrying. Similar null findings were found when examining levels of gun carrying among male students in the sample. Specifically, social conditions in schools' attendance areas were also unrelated to between-school variation in gun carrying among male students.

Current findings, therefore, offer no support for the conventional wisdom that community conditions discernibly affect levels of weapon carrying in and around schools (i.e., spillover hypothesis). Consequently, current findings are unable to challenge the implementation of many school-based violence prevention programs that do not attempt to manipulate or change social conditions external to schools (i.e., individual-change interventions). Finally, the limitations of this research are thoroughly discussed in order to address how future research can further advance the systematic study of the effects of community conditions on violence in and around schools.

CHAPTER 1

SCHOOL VIOLENCE

INTRODUCTION

On January 17, 2001, Juan Matthews, a freshman at Lake Clifton Eastern High School in Baltimore, Maryland, died after being shot three times while standing in front of his school. The alleged perpetrators of the shooting were students from another city school, and, by most accounts, the shooting appeared premeditated. When asked to comment about the shooting, the acting superintendent of schools, Barry Williams, remarked that:

> *All I can imagine is that this is something that came from the community and spilled over onto the school grounds* (CNN, 2001).

In commenting on this tragedy, Superintendent Williams expressed an often held belief that broader community conditions shape the occurrence of violence in and around schools. Although some formal theories of crime elaborate on the interplay between communities and schools (see e.g., Bursik and Grasmick, 1993), it intuitively makes sense to assert that social conditions external to schools have an effect on the social conditions internal to schools. One would speculate, therefore, that this sensible argument has been explored with some regularity in the literature; that is, the completion of research that has systematically addressed whether community characteristics (e.g., level of crime) shape the incidence of violence in and around schools. But as some scholars have pointed out (e.g., Laub and Lauritsen, 1998; Welsh, Greene, and Jenkins, 1999; Welsh, Stokes, and Greene, 2000), few studies have attempted to identify the influence of broader contextual conditions on the occurrence of violence in schools.

The sparseness of empirical research specifically concerned with the relationship between communities and in-school violence is unfortunate for a number of reasons, but the most important reason arguably is the potential influence such research could have on policy relevant to school violence. For example, based on the aforementioned remarks by Superintendent Williams, would one promote the use of school-based prevention programs that were entirely premised on the assumption that school violence results from deficiencies in the student (e.g., low self-control or poor conflict mediation skills)? The obvious response to this question seems to be no, for the implication of his comment suggests that communities matter too. But as Astor and Meyer (2001) indicated, most violence prevention programs implemented in schools are individually-based in that school misconduct is assumed to be a consequence of student inadequacies and *not* a consequence of environmental conditions in schools (e.g., poor disciplinary practices) or communities (e.g., level of crime).

There certainly is no absence of calls for violence prevention programs that embrace a "comprehensive" philosophy, however (see e.g., Hinkle and Stuart, 2000; Hughes, Humphrey, and Weaver, 2005).[1] Particularly in the case of youth violence, there is a growing sentiment that prevention programs must acknowledge that underlying causes of adolescent violence manifest themselves across multiple social contexts or environments, such as in the family, school, and community (see e.g., Dahlberg and Potter, 2001; Howell, 1995). Other scholars consider this comprehensive stance on youth violence or misbehavior as consistent with the "ecological-developmental perspective" (see e.g., Fraser, 1996; Germain and Gitterman,

[1] Within the context of discussing violent prevention/intervention programs, the use of a "comprehensive" philosophy or framework has come to represent a number of meanings in the literature. For instance, some scholars have alluded to comprehensive prevention programs as those in which inter-organizational efforts are undertaken (see e.g., Peterson and Esbensen, 2004; Sridharan and Gillespie, 2004). Throughout this research, the use of the term comprehensive is simply intended to capture the broader conceptual philosophy that causes of adolescent violence are present across multiple social contexts.

1995). Within the context of this perspective, intervention or prevention programs are most effective when they improve an adolescent's standing or "fit in various microsystems" (e.g., family, school, and neighborhood; Nash, 2002: 73).

The use of a comprehensive philosophy has been promoted by some researchers as a more effective approach to reduce school violence than programs entirely focused on the student (see e.g., Bowen and Van Dorn, 2002; Cunningham, Henggeler, Limber, Melton, and Nation, 2000; Laub and Lauritsen, 1998; National Research Council, 1993; Pollack and Sundermann, 2001). Notably, a comprehensive philosophy is more consistent with the remarks of Superintendent Williams that school violence is viewed as brought about by conditions internal *and* external to schools. As mentioned, however, few studies have attempted to formally test the argument that external community conditions affect the incidence of student violence in schools, which would address, in part, the broader merits of Superintendent Williams' remarks and also the need for comprehensive programs to effectively reduce school violence.

In an effort to address the lack of research examining the relationship between community characteristics and in-school violence, this study uses data from the National Longitudinal Study of Adolescent Health (Add Heath) to examine whether community conditions external to high schools have an effect on the prevalence of student violence in schools. More specifically, three contextual measures of a school's attendance area—economic disadvantage, residential mobility, and violent crime—are used to predict a student's likelihood of carrying a weapon to school, while controlling for the influence of student (e.g. gender) and school (e.g., size) characteristics.

Some conceptual arguments concerning the relevance of community conditions on school violence are consistent with the "importation" or "spillover" hypothesis. The underlying premise of this hypothesis is captured in some respect by the quote provided by Superintendent Williams; that is, that violence in schools is simply an extension of violence or problems in the broader community (McDermott, 1983; Sheley, McGee, and Wright, 1992; Sheley and Wright, 1992). Interestingly, as Sheley et al. (1992) seem to imply, accepting the spillover hypothesis suggests that schools themselves are *not* a cause of youth violence both within and beyond their walls (see also Sheley, McGee, and Wright, 1995; Menacker, Weldon, and Hurwitz, 1990).

As Gottfredson (2001: 2) noted, however, "Most criminological perspectives on the causes of delinquency have implicated schools." For example, Hirschi's (1969) social control theory postulates that a strong attachment to school serves to control delinquent behavior, and strain theories view schools as prospective places where adolescents struggle to embrace mainstream or middle-class values (e.g., aspirations to achieve in the classroom) and thus schools become a source of strain in youths' lives (Cohen, 1955). The spillover hypothesis, therefore, runs contrary to some criminological perspectives in assigning little to no weight to schools as a potential cause of youth violence.

Certainly the importation argument is appealing to some extent to school administrators and staff, for with this perspective schools would presumably bear less responsibility for acts of student violence that occur under their supervision. On the other hand, much research has examined the influence of schools on the academic and nonacademic outcomes of students (see Gottfredson, 2001 for a review), and, in general, results seem to suggest that schools can have a discernable effect on the behaviors of their pupils. A few

perspectives that offer explanations as to how schools shape student behaviors and achieve desired outcomes include theories of school climate (see Anderson, 1982) and the schools-as-communities perspective (see Furman, 2002; Payne, Gottfredson, and Gottfredson, 2003; Sergiovanni, 1993). These perspectives are not completely at odds with the spillover or importation hypothesis (see e.g., Mawhinney, 2002), but they do emphasize a different set of contextual predictors in explaining student behaviors at school. To be more precise, the school effects literature underscores the importance of the *school environment* in explaining student behaviors at school, whereas the spillover hypothesis views external *community conditions* as more proximate determinants of student behaviors and violence in particular at school.

This research examines whether measures of a school's attendance area have a discernable effect on *school-based weapon carrying* after accounting for particular measures of a school's environment. According to the spillover hypothesis, it is presumed that community variables should have a sustained effect on weapon carrying after controlling for measures of a school's environment. Of course, the implications of such findings are important in that support for the spillover hypothesis would in turn offer support for the integration of communities in order to effectively reduce school violence and weapon carrying in particular. On the other hand, if broader community conditions are rendered insignificant after accounting for environmental characteristics of schools, such findings would provide support for the continued implementation of school-based prevention programs that disregard external community conditions altogether (see e.g., Gottfredson, Wilson, and Najaka, 2002 for a review of some of these school-based prevention programs).

Recent contextual studies conducted by Welsh et al. (1999) and Benbenishty and Astor (2005) indicated that external community conditions, such as the level of poverty and unemployment, were related to in-school victimization and offending among middle school and high school students in Philadelphia and Israel. Although neither of these studies examined school-based weapon carrying specifically, studies performed by Cook and Ludwig (2004) and Molnar and colleagues (2004) found that neighborhood or community-level factors, such as the robbery rate and poverty level, were associated with an adolescent's likelihood of carrying a handgun or weapon in the community. Thus, current empirical evidence suggests that community characteristics have an effect on adolescent weapon carrying away from school. Integrating these findings with the spillover hypothesis suggests that community factors should affect the prevalence of adolescent weapon carrying in schools as well, especially in light of the noted findings which indicate community factors influence other forms of in-school victimization and offending (Welsh et al., 1999; Benbenishty and Astor, 2005).

This research tests directly whether community characteristics affect the prevalence of youth weapon possession in schools. Namely, this study makes a contribution to the literature in a couple ways. First, through the use of multilevel modeling, this research concurrently tests for the effects of community, school, and individual characteristics on the likelihood of a student carrying a weapon to school. As noted, Welsh et al. (1999) and Benbenishty and Astor (2005) tested for similar effects on in-school victimization and offending, but they did so with school-based samples from Philadelphia and Israel and did not address in-school weapon carrying specifically. This research, however, uses a nationally representative sample of high schools in the U.S. to explicitly examine school-based weapon carrying. Utilizing a

nationally representative sample of U.S. high schools should improve the broader implications of the research findings. Furthermore, most persons would agree that school weapon carrying is a serious public health concern, and this general agreement was likely solidified all the more in the wake of the school shooting incident at Columbine High School in 1999. Unlikely a result of happenstance, much research has examined the prevalence of school-based weapon carrying since the shooting tragedy at Columbine High School (see e.g., Forrest, Zychowski, Stuhldreher, and Ryan, 2000; Kodjo, Auinger, and Ryan, 2003; Williams, Mulhall, Reis, and DeVille, 2002), but these studies seldom have addressed whether community conditions influence the possession of weapons among students at school.

Along with identifying the importance of community characteristics on student weapon carrying, the implications of current findings for school violence prevention are discussed as well. As briefly outlined above, theories of school climate, the spillover hypothesis, and arguments for comprehensive prevention programs each underscore the importance of different social contexts in explaining school violence. Therefore, findings from this research are used to address the merits of these arguments and their potential implication for violence prevention programs in schools. For example, if it is determined that in-school weapon carrying is unrelated to external community conditions, such findings would be consistent with the assumptions of most school-based prevention programs that either directly or indirectly view the student or school as the primary cause of violence in schools (Astor and Meyer, 2001).

The implications of this study's findings for future research are also addressed. As noted, three "community" variables are examined in this research, and they each represent

aggregate measures of a school's attendance or catchment area. In their study with Philadelphia middle schools, Welsh et al. (1999) constructed similar variables and referred to them as measures of the "imported school community." Although aggregate measures of the imported school community capture differences in community characteristics *between* schools, they are unable, however, to account for variation in residential areas *within* school attendance areas. This limitation is presumably most relevant in the case of large urban and suburban high schools, which likely receive students from diverse residential areas. Accordingly, an aggregate measure of a school's attendance area would not capture this meaningful variation. As noted, such measures were employed in this research and findings derived from these variables have important implications for how measures of a school's community are constructed in future research. This measurement issue, as well as other methodological and conceptual matters, is addressed more thoroughly in the concluding chapter in order to discuss its implications for future research.

This chapter proceeds with a brief overview of the extensive growth in school violence research over the last 25 years or more. Within this discussion, time is especially taken to address specific events or social trends which prompted calls for the further development of school violence research. As will be discussed, the progression of school violence research has been slow to empirically address the importance of external community conditions on school-based outcomes, however. Following a short discussion of school violence research, recent trends in youth violence both in and away from school are examined in order to place the incidence of school violence in context. In particular, rates of youth violence in the early 1990s are compared to more recent rates of youth violence to identify changes in levels of adolescent delinquency. The incidence of gun carrying and youth homicides in school is also

compared to the prevalence of the broader behaviors of weapon possession and weapon victimization in schools. Given the extensive coverage that school shooting incidents receive, it is too often the case that other weapon-related activities in schools are not as rigorously addressed. Finally, some time is spent discussing the community-school relationship and its potential influence on youth violence.

SCHOOL VIOLENCE

A Growing Body of Research

Over the last 25 years, much research has turned its attention to the incidence, causes, and prevention of school-related violence (e.g., Toby, 1983; Gottfredson and Gottfredson, 1985; Bastian and Taylor, 1991; Elliott, Hamburg, and Williams, 1998; Gottfredson, 2001; Moore, Petrie, Braga, and McLaughlin, 2003). Indeed, even a cursory search of the existing literature for school violence research would lead one to conclude that such research has become a mainstay across multiple disciplines, such as psychology and social work to name a few. It is easy to understand, however, why studies focused on school violence have come to represent a considerable share of all research devoted to youth delinquency and victimization, for as some scholars have noted, second only to the family the school bears the largest responsibility for socializing school-age youths (Gottfredson et al., 2002; Jenkins, 1995). Gottfredson et al. (2002: 159) bolstered this argument in stating that "No other organization has such frequent access to students over such a long duration," for it is estimated that students spend approximately 18 percent of their waking hours in school during the academic year (Gottfresdson, 2001). It seems reasonable to find, therefore, that schools have become, in some sense, ground zero for the delivery of prevention programs intended to reduce youth violence.

Along with some of these more obvious reasons (e.g., time spent in school) for school violence research, the recent growth in this body of research has been prompted by a number of other factors. For instance, although matters relating to school violence had been discussed in the public forum for many years prior to the study, Anderson (1998: 318) noted that it was not until 1978, with the release of the National Institute of Education's (1978) report entitled "Violent Schools – Safe Schools: The Safe School Study Report to Congress," that public concerns about school violence were systematically examined on a national level. The Safe School Study brought to light the national pervasiveness of student victimization in junior and senior high schools throughout the country and, in the process, helped generate additional research concerning school violence (e.g., Gottfredson and Gottfredson, 1985). More recently, this line of research has been aided by the greater availability of national school-based data, such as the Centers for Disease Control and Prevention's Youth Risk Behavior Survey (YRBS) and the School Crime Supplement (SCS) to the National Crime Victimization Survey (see Addington, Ruddy, Miller, and DeVoe, 2002; Brener, Kann, Kinchen, Grunbaum, Whalen, Eaton, Hawkins, and Ross, 2004).

Another contributing factor was that rates of homicide among adolescents increased to historically high levels in the late 1980s and early 1990s (Blumstein, 1995; Fox, 1996). The bulk of this increase was attributed to handgun violence associated with the growth of urban drug markets (Blumstein and Wallman, 2000). A consequence of this escalation in serious youth violence was that public concerns were raised as to whether violent behaviors in the broader community were "spilling over" into the hallways of schools throughout the country (see e.g., Elliott et al., 1998). In particular, given the significance of firearms in contributing to record numbers of lethal encounters among adolescents in the late 1980s and early 1990s,

questions surfaced as to whether guns were finding their way into schools in record numbers as well (DeWitt, 1993; *USA Today*, 1992).

Firearm research untaken in the early 1990s tended to legitimize these concerns. Callahan and Rivara (1992) indicated, for example, that nearly seven percent of males in their sample of public school students in Seattle, Washington had carried a handgun to school at some point. Callahan and colleagues (1993) found an even greater prevalence of gun carrying among an institutionalized population in King County, Washington. Specifically, they found that 46 percent of male detainees in their sample had disclosed bringing a handgun to school within three years of the survey. Sheley and Wright (1995), with a sample of male students attending 10 inner-city high schools, also discovered an alarmingly high proportion of students possessing weapons at school. These researchers found that three percent of students in their sample were currently carrying a gun in school "all" or "most of the time," while an additional six percent of students reported carrying a gun in school at least "now and then." An equally high level of gun activity was reported by other researchers with students attending mainly urban or inner-city schools during the early 1990s (e.g., Vaughan, McCarthy, Armstrong, Walter, Waterman, and Tiezzi, 1996; Webster, Gainer, and Champion, 1993). The composition of youth samples in many of these studies were not unintended in that firearm violence was considered primarily an inner-city problem (Sheley and Wright, 1995). Thus, the broader community context proved important during the early 1990s in shaping where and among whom researchers elected to even study violence and gun carrying in schools.

More recent national data indicates that, much like youth violence overall, the level of firearm and weapon activity among students at school has declined since the early 1990s

(Addington et al., 2002; DeVoe, Peter, Kaufman, Miller, Noonan, Snyder, and Baum, 2004). But multiple victim school shootings in the most unsuspecting of places, such as Pearl, Mississippi (1997); Paducah, Kentucky (1997); Jonesboro, Arkansas (1998); Littleton, Colorado (1999); Cold Spring, Minnesota (2003); and Red Lake, Minnesota (2005), have challenged the notion that firearm violence in schools is an inner-city and fleeting problem. Indeed, a study conducted by the U.S. Secret Service (2000) of 37 "targeted" shootings in American schools concluded that no useful or accurate profile of a school shooter could be identified. For instance, it was observed that:

> *They [school shooters] came from a range of family situations, from intact families with numerous ties to the community to foster homes with histories of neglect* (p. 5).

In other words, one conclusion that could be deduced from this study is there was no clear indication that specific school or community characteristics, such as racial composition and urban setting, were associated with the environment in which school shooters carried out their deadly acts.

On the one hand then, research undertaken in the late 1980s and early 1990s discovered that youth involvement in firearm activities in many inner-city schools was not unusual, which further solidified the belief that gun violence in schools was an urban problem. On the other hand, recent shootings in schools located outside the boundaries of inner-cities, although infrequent in number, called into question the typical school and community characteristics most associated with deadly acts of school violence. Given these rather contradictory findings, one might anticipate sizeable growth in research that isolates the potential influence of community characteristics on the incidence of school-based violence.

But as mentioned, few studies have made an effort to identify the possible influence of community conditions on in-school violence in general and weapon carrying in particular (Laub and Lauritsen, 1998; Welsh et al., 1999). Therefore, even though research concerning school violence has grown considerably in the last 25 years or more, an underdeveloped segment of this research, however, is studies that account for the larger environmental conditions in which schools operate.

It was pointed out that rates of homicide among adolescents were at disturbingly high levels in the late 1980s and early 1990s (Blumstein, 1995; Fox, 1996), and this surge in youth violence raised many concerns over the possible spillover of community violence into schools. This chapter proceeds with an overview of more recent trends in adolescent violence both in and away from school, with particular attention paid to how current patterns in juvenile violence deviate from the early 1990s. For instance, are rates of youth violence in and way from school lower than rates in the early 1990s? Addressing such questions help facilitate a discussion of school violence by placing the incidence of this phenomenon in context and, for purposes here, help empirically justify the study of the broader behavior of weapon carrying in schools as opposed to the more infrequent behavior of gun carrying.

Recent Trends

We are not far removed from a time when rates of youth violence were at "unprecedented" levels (Cook and Laub, 1998), and youth criminals were viewed as a new breed of "superpredators" (Bennett, DiIulio, and Walters, 1996). Namely, rates of youth violence climbed to unparalleled levels in the late 1980s and early 1990s (Blumstein, 2000; Moore and Tonry, 1998), which understandably prompted much discussion about the causes and prevention of adolescent violence (see e.g., Tonry and Moore, 1998; Zimring, 1998). In

examining more recent patterns in youth violence, however, it is encouraging to find that rates of serious victimization and offending among adolescents have declined substantially since the late 1980s and early 1990s. Figure 1.1 illustrates this point by displaying violent victimization rates for adolescents from 1973 to 2003. In particular, victimization rates are displayed for persons aged 12 to 15 and 16 to 19 in Figure 1.1, with trends revealing that violent victimization peaked in 1994 for each age group and then proceeded to decline for seven consecutive years.

As evident in Figure 1.1, the decline in victimization rates for each age group was far from trivial. Indeed, from 1994 to 2002, this precipitous decline for adolescents aged 12 to 15 corresponded to a 63 percent reduction in their victimization rate, and, for adolescents aged 16 to 19, their victimization rate from 1994 to 2001 declined by only a slightly smaller percentage (55 percent). Also important, Figure 1.1 reveals that current rates of youth victimization are at their lowest levels in more than 30 years. Figure 1.2 further verifies recent declines in youth violence by presenting violent arrest rates for persons less than 18 years of age from 1994 to 2003. These arrest data provide further confirmation that rates of youth violence have substantially declined since 1994.

Given these overall trends in youth violence, it should not be surprising to report that rates of adolescent violence *in school* have also declined since the early 1990s (DeVoe et al., 2004; O'Donnell, 2001; Snyder and Sickmund, 1999). Figure 1.3 illustrates this trend by displaying the rate of nonfatal violent victimization in and away from school for students aged 12 to 18. A couple points are worth noting in this figure. First, although rates of violence *in school* have fallen for students since the early 1990s, the magnitude of this decline is less profound than the case for rates of victimization *away from school*. Moreover, at least among

adolescents aged 12 to 18 and enrolled in school, Figure 1.3 indicates that in recent years a student's risk for experiencing interpersonal victimization in school is just as great as their risk away from school; thus school and non-school violent victimization rates have converged in recent years (see also Snyder and Sickmund, 1999, 2006).

It seems reasonable to find that rates of interpersonal victimization were greater for students away from school than in school during the early 1990s, for students spend less time in school and thus have fewer opportunities to experience acts of violence there. In assuming this level of exposure (i.e., time in school) has remained relatively stable from 1992 to 2002, one would not expect to find converging rates of school and non-school interpersonal victimization when thinking about these trends within the context of the spillover hypothesis. That is, one would likely anticipate that school and non-school victimization rates rise and fall in unison. Here again, keeping in mind that the spillover hypothesis contends that violence in school is merely a reflection of violence in the broader community, victimization rates in and outside of school should presumably parallel each other over time and thus not converge. The application of the spillover hypothesis on a national level is indeed questionable, but the presumed sensitivity of schools to broader ecological conditions, as postulated by the spillover hypothesis, appears unsupported with recent rates of school and non-school victimization displayed in Figure 1.3.

Overall, rates of youth violence are at relatively low levels both in and outside of school, although recent patterns suggest that rates of serious violence have stabilized for adolescents in recent years (DeVoe et al., 2004). There also may be some cause for concern that rates of interpersonal crime for students in and away from school have converged of late. But as some scholars have been careful to point out (e.g., Gottfredson, 2001; Gottfredson,

Gottfredson, Payne, and Gottfredson, 2005), schools serve as relatively safe places for students from more serious acts of violence (e.g., robbery). For example, only 22 percent of all *serious* violent crimes (i.e., rapes, sexual assaults, robberies, and aggravated assaults) committed against students (aged 12-18) in 2002 occurred at school. This percentage increases to approximately 48 percent when simple assaults are considered in addition to serious violent crimes. Overall, well over three-fourths (*88 percent*) of interpersonal crimes (i.e., rapes, sexual assaults, robberies, aggravated assaults, and simple assaults) committed against students *at school* were simple assaults in 2002. In contrast, only about *40 percent* of these same interpersonal crimes committed against students *away from school* were simple assaults in 2002.[2] In general then, the vast majority of interpersonal crimes that occur at school can be characterized as *not* involving a weapon or resulting in any serious injury to the victim; thus qualifying them as simple assaults.

Unfortunately, however, school shooting incidents, such as the aforementioned student shooting in Baltimore, often and understandably receive extensive media attention which likely distorts the public's understanding that such fatal events are uncommon in American schools. Indeed, in the 10 school years from 1994 to 1995 through 2003 to 2004, there were only 262 violent deaths associated with schools in the U.S (National School Safety Center, 2004). Table 1.1 further corroborates the uncommonness of these lethal events by displaying the number of school age youths (aged 5 to 19) murdered at and away from school from 1992 to 2002. Two substantive points are fairly evident in Table 1.1. First, and most obvious, is that youth homicides at school are highly infrequent events relative to their occurrence in the broader community. Second, and consistent with victimization and offending data discussed thus far, the incidence of homicide at and away from school for adolescents has declined

[2] These percentages were calculated from NCVS data provided by DeVoe et al. (2004) in Tables 2.1 and 2.3.

noticeably since the early 1990s. In general, it is evident from Table 1.1 that rates of homicide or fatal injury in U.S. schools are low (Anderson et al., 2001), especially when compared to rates of homicide away from school.

Weapon Carrying

Student homicides that occur at school often serve to remind us of a grim consequence of adolescents brining guns to school: potential death. It is important to point out, however, that the death of an adolescent is but one consequence of students bringing guns to school and also but one manner in which weapon violence is carried out in schools, which can be overshadowed in the wake of all the media attention that surround school shootings. What is vastly more common in schools than adolescents bringing guns to inflict fatal injuries on their classmates are students bringing *non-firearm* weapons to school and electing to: *not* use their weapon, *threaten* to use their weapon, or use their weapon to inflict *minor injuries* (Anderson et al., 2001; DeVoe et al., 2004).

Accordingly, limiting one's focus to the study of gun carrying and school shooting incidents fails to recognize more common weapon-related activities in schools, which also possess the capacity to make teaching and learning difficult by fostering an environment of fear and apprehension (Aspy, Oman, Vesely, McLeroy, Rodine, and Marshall, 2004; Ingersoll and LeBoeuf, 1997). Moreover, the potential for interpersonal confrontations among students to end in physical injury or death still exists when non-firearm weapons are involved in confrontational incidents (Forrest et al., 2000; Kodjo et al., 2003). Also, in light of the socializing power of the school (Gottfredson and Hirschi, 1990: 105), weapon-related incidents of all types at school are a matter of concern because of their potential adverse effects on adolescent development.

In further elaborating on these issues in empirical terms, the 1999 School Crime Supplement to the National Crime Victimization Survey indicated that 0.3 percent of students aged 12 to 18 reported bringing a *gun* to school "for protection" in the six months prior to survey, whereas 1.5 percent of the students sampled reported brining *any weapon* to school for protection (Addington et al., 2002). These percentages indicate that of the reported weapon carriers approximately one in five reported brining a gun to school. Overall, only a very small faction of youths among this national sample of students chose to carry a weapon to school for protection, but when they did decide carry a weapon, they overwhelming chose to carry a weapon *other* than a gun. Here again, if a researcher elects to focus exclusively on gun carriers, then the largest segment of school weapon carriers, who also put the physical and emotional well-being of their classmates and teachers at risk, is disregarded.

Table 1.2 displays recent trends in the prevalence of weapon carrying and weapon victimization among students at school. The prevalence of these student behaviors comes from the Centers for Disease Control's Youth Risk Behavior Survey, which is conducted biennially with a national sample of students in grades 9 through 12 (Brener et al., 2004). Consequently, these data do not permit an annual investigation of student behaviors. The number of adolescents aged 5 to 19 who were murdered at school is also displayed in Table 1.2 in order to illustrate once again the infrequency of these events. We find in Table 1.2 that nearly 12 percent of high school students reported carrying a weapon on school property at least once in the 30 days prior to the survey in 1993, while approximately 6 percent of students reported carrying a weapon on school property ten years later in 2003. The prevalence of school-based weapon carrying among students therefore has declined substantially since the early 1990s, which again is consistent with the overall pattern of youth

violence. Since 1999, however, the prevalence of reported weapon possession at school has remained relatively stable around six percent.

Also conveyed in Table 1.2 is the finding that students are far more likely to be threatened or injured with a weapon at school than fatally harmed by one. What might be more noteworthy in Table 1.2 is the finding that school weapon victimization has remained fairly stable and even increased in occurrence in recent years. This finding would not likely be anticipated by anyone in light of the declining trend in youth violence in general and school weapon carrying more specifically. In other words, it seems counterintuitive to find that school weapon carrying has stabilized in recent years, yet school weapon victimization has increased over this same period. This conflicting relationship suggests that either a shrinking population of school weapon carriers are offending more often on a larger pool of victims, or that a greater fraction of school weapon carriers are actually using their weapon as opposed to just idly carrying their weapon. Irrespective of the possible explanation, the potential benefit to successfully identifying school weapon carriers is the probable effect it would have on reducing weapon victimization in schools, which appears to be on the rise in terms of prevalence in recent years.

Community Context

Within the context of the spillover hypothesis, the defining characteristic of this research is the incorporation of community variables to examine their effect on *in-school* weapon carrying. In other words, this study identifies whether conditions external to schools affect in-school misbehavior. The conceptual underpinnings of this process are addressed more thoroughly in the next chapter, but it is meaningful to point out for now that some scholars have noted that the community-school relationship is a reciprocal one, especially

with respect to crime. That is, communities not only affect schools, but schools also affect communities (see e.g., Gouvis Roman, 2004). For example, Roncek and Lobosco (1983), with 4,586 "residential city blocks" in San Diego, tested whether city blocks that had high schools located within their boundaries or were immediately adjacent to city blocks with high schools had higher levels of violent and property crime, while controlling for structural differences in the composition of the city blocks (e.g., percent Black). It was found that proximity to a public high school was in fact associated with higher levels of property and violent crime for a city block (see also Roncek and Faggiani, 1985). Roncek and Lobosco explained this finding in terms of the effects that nonresidential land use have on a locality's crime level (i.e., nonresidents frequenting an area) and, based on the arguments of Cohen and Felson (1979), how schools regularly bring together potential offenders and suitable targets (i.e., adolescents).

In thinking about weapon violence, owners or users of weapons often report possessing them for protective or recreational purposes (Cunningham et al., 2000; Sheley and Wright, 1995), but research generally finds that it is protective users who are more prone to be involved in criminal or delinquent activities (Callahan and Rivara, 1992; Lizotte, Tesoriero, Thornberry, and Krohn, 1994). In applying this logic to school weapon carrying, students who report carrying a weapon to school presumably to do so for reasons of self-protection, for recreational or sporting purposes are not likely to motivate students to carry weapons to school (Coggeshall and Kingery, 2001). Accordingly, it stands to reason that students who carry weapons to school (i.e., protective users) are more likely to be victims or perpetrators of violence than students who choose not to carry weapons. Existing research, indeed, has found a moderate to strong level of association between student involvement in weapon carrying and

one's corresponding likelihood of being a victim (DuRant, Krowchuk, Kreiter, Sinal, and Woods, 1999; Wilcox and Clayton, 2001) or perpetrator (Kodjo et al., 2003; Williams et al., 2002) of violence.

Given the relatively low prevalence of school weapon carrying, it seems unlikely that students or schools have a profound effect on levels of weapon violence in nearby or surrounding neighborhoods. But it does stand to reason that students who carry weapons to school, and thus prone to be involved in other acts of delinquency, are likely to carry weapons in the broader community as well. For as Gottfredson (2001) noted, even the most incompetent of schools probably provide some basic level of supervision over their students. Thus, students who carry weapons to school likely have few reservations about carrying weapons in the broader community, for levels of adult supervision in the general community are probably less perceptible than levels of adult supervision in school. This line of reasoning is consistent with the finding that weapon carrying among students off school property is more prevalent than weapon carrying on school property (Coggeshall and Kingery, 1999; Simon, Crosby, and Dahlberg, 1999).

From a prevention standpoint, therefore, effectively identifying school weapon carriers could serve not only to alleviate youth weapon carrying and victimization in schools but in surrounding school neighborhoods to some extent as well. At the very least, the taunting task of preventing youth weapon carrying is more easily undertaken in a school setting compared to the broader community for schools represent a more controlled environment, which likely explains the commonness of school-based prevention programs in general. Again, however, it seems improbable that weapon violence associated with schools has a profound effect on weapon violence among adolescents in the broader community. What is expanded upon in

the next chapter is the counter argument that communities have a profound effect on in-school violence (i.e., spillover hypothesis). For now, the important characteristic of each of these arguments is the emphasis placed on the interplay between communities and schools, irrespective of the proposed processes at work.

SUMMARY

Again, this research contributes the literature by simultaneously identifying the effects of student, school, and community factors on *in-school weapon carrying*. In examining the influence of neighborhood conditions on educational attainment, Garner and Raudenbush (1991: 251) noted the difficultly involved in disentangling the multiple factors that condition attainment, and they proceeded to reference a report that characterized these overlapping factors as "that seamless web of circumstance." In highlighting the multilevel nature of school disorder, Welsh and colleagues (1999: 83) stated that "Research and intervention efforts have too often been piecemeal, examining specific variables and levels of analysis [social contexts] in isolation from one another." In other words, much school violence research has ignored, at least empirically, "that seamless web of circumstance" that affects student misconduct. Gottfredson (2001: 68) noted this oversight has generally occurred in school-based research by way of studies failing "…to measure and separate school from community contextual effects [and thus] provide only a combined estimate of the two effects." This research overcomes this shortcoming by using data from the National Longitudinal Study of Adolescent Health; a study designed to examine how various social contexts (e.g., communities, schools, and families) distinctly and concurrently affect the health and risk behaviors of adolescents.

Clearly rates of youth violence in and away from school have declined substantially since the early 1990s. It further appears that levels of weapon carrying among students in school have also descended in occurrence in recent years. As noted, however, the prevalence of students who report being threatened or injured with a weapon on school property has slightly increased to approximately nine percent of high school students in 2003. Moreover, it is apparent that when students are victimized with a weapon at school it is usually committed with a weapon other than a gun. In recognition of this finding, this research examines the effects of student, school, and community factors on the broader behavior of *school-based weapon carrying*. From these findings, the potential implications for school-based prevention programs, such as "comprehensive" initiatives, and future research are discussed in detail.

CHAPTER 2

LITERATURE REVIEW

INTRODUCTION

In keeping with the objectives of this research, this study proceeds with a review of research examining the effects of individual, school, and community-level characteristics on student or school misconduct. Much of the prior research highlighted below in the "individual effects" section of this review examined school-based weapon carrying specifically. This was feasible because a growing body of research embedded in the "risk" and "protective" factors literature has identified *student-level* predictors of weapon possession at school. This assessment of individual characteristics related to in-school weapon carrying is intended to be a comprehensive review, although not an exhaustive one. Identifying a representative cross-section of student factors associated with school weapon carrying that can be measured with the Add Health data is imperative, for as Garner and Raudenbush (1991: 251-252) indicated, "A rigorous specification of the individual-level model must be made to counter Hauser's (1970) argument that the effects from groupings at a higher level [here, school-level groupings] are no more than artifacts of poorly specified individual-level models." Hauser (1970: 658) referred to this error as the "contextual fallacy"; that is, declaring groups effects that are actually a consequence of different types of persons within those groups (see also Hannan, 1971; Laub and Lauritsen, 1998; Robinson, 1950).

Contrary to the review of research for individual effects, the literature noted in the "school effects" and "community effects" sections of this review had to draw from a wider spectrum of studies because little research has examined the effects of school or community characteristics on in-school weapon carrying. Consequently, research discussed in these

sections examined a broader variety of school-based outcomes than weapon carrying specifically (e.g., student absenteeism and dropout).

INDIVIDUAL EFFECTS

Sociodemographic Characteristics

Individual or student-level covariates of school-based weapon carrying have been explored with greater frequency in the literature than school or community-level covariates. Wilcox Rountree (2000) and Wilcox and Clayton (2001) conducted a review of this literature and identified at least four general sets of student variables that have been used to examine weapon carrying at school. The most common of these variables are those which account for the sociodemographic characteristics of students (e.g., gender, race, and age). Studies have consistently identified, for example, that male students carry weapons to school more often than female students. Indeed, some research has shown as much as a three to fourfold difference between males and females in their self-reported prevalence of school weapon carrying (DuRant, Kahn, Beckford, and Woods, 1997; DuRant et al., 1999).

The documented effects of race or ethnicity on school weapon carrying, unlike gender, have not been so clear. Some research suggests that minority students are slightly more apt than White students to carry weapons to school (May, 1999; Wilcox and Clayton, 2001). Kodjo et al. (2003), however, only found race/ethnicity effects among female students and not among male students, while DuRant et al. (1999) only reported a significant relationship between minority status and carrying guns to school; a similar relationship was not sustained when the outcome was carrying non-firearm weapons (e.g., knives) to school. Overall, the importance of race in predicting school weapon possession is generally marginal (Kingery, Coggeshall, and Alford, 1999), and this relationship often dissipates after controlling for other

theoretically relevant variables (Bailey, Flewelling, and Rosenbaum, 1997; Wilcox Rountree, 2000; Williams et al., 2002).

Similarly, the influence of age or grade level on school weapon carrying is not particularly clear. Some scholars have reported a greater tendency for younger students to carry weapons to school (Friday, 1996), while others have found little or no relationship between age/grade level and weapon carrying (Coggeshall and Kingery, 1999; Simon et al., 1999; Simon, Dent, and Sussman, 1997; Wilcox Rountree, 2000). Wilcox and Clayton (2001), however, uncovered a curvilinear relationship between age and school weapon possession among students in grades 6 to 12. More precisely, they found that weapon carrying increased with age but that the rate of the increase decelerated or leveled out among older students. Forrest et al. (2000), with a national sample of seventh to twelfth graders, revealed similar findings in reporting that the prevalence of school weapon carrying peaked among ninth graders and then slowly declined among students in upper-grade levels (see also Hill and Drolet, 1999). A decline in the prevalence of weapon carrying among older students is consistent with the argument that the most troubled adolescents (i.e., probable weapon carriers) select themselves out of school by the eleventh and twelfth grades (Kulig, Valentine, Griffith, Ruthazer, 1998). In general, these studies suggest that age or grade effects are more likely to be discerned when samples include both middle school *and* high school students, and, among such samples, age effects are nonlinear. In a high school only sample (which is the case in this research), therefore, the effect of student age on weapon carrying is likely less discernable.

Measures of student socioeconomic status (SES) also have been explored to a limited extent in the literature. Martin and colleagues (1996) conducted a study with 376 African

American students in a city in North Carolina and found a "borderline relationship" between student enrollment in a free lunch program and weapon carrying at school. Likewise, Williams et al. (2002), with public school students in Illinois, revealed that students who were eligible for a free school lunch were more likely to carry handguns to school than students who were not eligible. Using parental education as an indicator of SES, Simon et al. (1999) with a national sample of high school students found that, compared to students whose parents graduated from college, students who had parents that had less than a high school education were more likely to carry weapons on school grounds. Wilcox and Clayton (2001) reported comparable findings with a sample of middle school and high school students in Kentucky. Kodjo et al. (2003), however, found no significant association between level of parent education and weapon carrying at school with a national sample of students in grades 7 to 12 (see also Simon et al., 1997). Although based on a limited number of studies, extant research appears to demonstrate a weak to moderate association between indicators of student SES and school weapon carrying.

Family Structure and Relationships

When people are asked to identify the primary causes of crime, Farrington (2000) noted they often believe crime is a consequence of poor parenting. This would explain the general popularity for laws that hold parents liable for the criminal actions of their children. Redding and Shalf (2001: 319), for example, identified polling data which indicated that "…69% to 75% of the American public support holding parents criminally or civilly liable for their child's use of a gun in a crime." These percentages would likely increase if persons were asked whether they supported the use of parental liability laws in cases where an

adolescent carried a gun to school, for there is common agreement that as communal organizations schools should serve as a safe haven from violence.

There has been much criminological research undertaken that has examined or addressed the importance of family and parental processes on youth violence (e.g., Gottfredson and Hirschi, 1990; Sampson and Laub, 1993). It is interesting to find, therefore, that most studies of school-based weapon carrying have not incorporated measures of family or parental dynamics. The few studies that have included family-related indicators, however, have revealed mixed findings. Baily et al. (1997), with a sample of seventh and eighth graders in Illinois, found that students who reported feeling closer to their parents were less likely to disclose carrying a weapon to school for purposes of self-protection. Wilcox and Clayton (2001), after adjusting for other covariates, reported no relationship between in-school weapon possession and a "family dysfunction" index with a sample of Kentucky students. Survey items comprising this index addressed such issues as whether or not a parent of the student had served time in prison, sought help for drug problems, or ever been in a psychiatric hospital. Williams et al. (2002) assessed family factors using three scales that captured family harmony, parental supportiveness, and parental monitoring. Regression analyses revealed that none of these scales were statistically significant in identifying sixth, eighth, and tenth graders in Illinois who had carried a handgun to school. These researchers did find, however, that students living in single-parent households were nearly two times more likely to carry a handgun to school than students residing in households with both biological parents. Forrest et al. (2000), among a national sample of seventh to twelfth graders, reported similar findings in that the odds of students residing in single-parent

households carrying a weapon to school were 55 percent greater than the odds for students in two-parent households (for contrary findings see Kingery et al., 1999).

A common finding in the broader violence research is that the quality of family interactions or relationships (e.g., parent-child bond) is a more important predictor of adolescent delinquency than family structure (e.g., intact family and family size; Laub and Sampson, 1988; Rankin and Kern, 1994). As noted, studies of school weapon possession have not found consistent family or parental effects, but when such effects have been documented, it has been indicators of family structure (i.e., single-parent households), as opposed to measures of family or parental dynamics, that have proven to be stronger determinants of adolescents carrying weapons to school. This conclusion, however, is based on a limited number of studies and questions still remain as to the strength of the relationship between family/parental dynamics and in-school weapon carrying.

Academic Performance and School Attachment

An assumption is often made among the general public that adolescents who regularly participate in delinquency and problem behaviors underachieve in the classroom. Existing research has shown a consistent relationship between low academic performance and adolescent delinquency (Gottfredson, 2001). Findings have been mixed, however, for studies that have examined the level of association between school performance and weapon carrying in and outside of school. Hemenway and colleagues (1996), with a sample of seventh and tenth graders from 12 inner-city schools, found that students who reported having grades that were below average, compared to average or above average grades, were more likely to disclose carrying a concealed gun at some point in their lives. Bergstein and colleagues (1996) found similar results when asking students in Boston and Milwaukee whether they had

ever handled a gun without adult supervision. More specifically, students who reported below average grades were more prone to report handling a gun. Interestingly, with a sample of male students in 53 schools, Sheley and Wright (1998) found a significant association between knife carrying outside the home and students' grades, but did not find a similar relationship with gun carrying. Contrary to these findings, Simon et al. (1998), with a sample of high school students in San Diego and Los Angeles counties, used students' grades in ninth grade to predict handgun carrying in twelfth grade and revealed no significant relationship for both male and female students. With two high schools in Boston, Kulig et al. (1998) also discovered no significant association between students' grades and ever carrying a weapon.

The few studies that have examined in-school weapon carrying exclusively also have revealed somewhat mixed findings for student academic performance. DuRant et al. (1997) reported a significant association between low academic achievement and weapon carrying on school property among high-school students in Massachusetts. Using the same school-performance measure, however, DuRant et al. (1999) were unable to replicate this finding with middle school students in North Carolina. Likewise, Bailey et al. (1997) found no significant relationship between grades reported by students and brining a weapon to school. These findings, along with research examining weapon carrying outside of school, suggest a rather weak association between academic performance (i.e., grades received, G.P.A.) and student weapon carrying, for this relationship seems sensitive to the composition of the sample (e.g., national vs. regional and middle-school vs. high-school students) and weapon carried (e.g, knife vs. gun).

Similar to academic performance, the broader violence research has generally found a moderate level of association between adolescent delinquency and indicators of school

attachment (Cernkovich and Giordano, 1992; Lawrence, 1998; Gottfredson, 2001). Research examining this relationship routinely tests the theoretical arguments of Hirschi's (1969) social control theory. In general, Hirschi contends that delinquency results when an individual's bond to traditional social institutions (e.g., family and school) is weak or broken. Hirschi identified four major elements that make up one's bond to society: attachment, commitment, involvement, and belief. Attachment and commitment are the two elements that have been tested with the greatest frequency in the literature.

Gottfredson (2001) indicated that attachment to school is typically measured with survey items that address the extent to which students like school and school personnel, while indicators of school commitment generally refer to a student's educational aspirations and their perceived usefulness of school. School involvement normally is addressed with items that capture student absenteeism and student participation in extracurricular activities at school, whereas belief generally pertains to whether students perceive school rules to be fair and enforced judiciously. All else equal, therefore, adolescents with a weak attachment (e.g., dislike school and teachers) or commitment (e.g., feel school is a waste of time) to school, as well as limited school involvement or belief in school rules, should be more likely to participate in delinquent activities relative to adolescents with a strong social bond to school. Although much research has examined the influence of school social bonds on delinquency in general, few studies have explored their effect on school delinquency specifically (Jenkins, 1997; Stewart, 2003; Welsh, 2000).

Research that has tested the level of association between school social bonds and school misconduct has provided partial support for Hirschi's social control theory. Jenkins (1997), for example, found that school commitment and belief in school rules were significant

predictors of students' participation in school crime (i.e., a 14-item index including weapon carrying), while school attachment and involvement were unrelated to this outcome. Likewise, Welsh et al. (1999) revealed an inverse relationship between school effort (i.e., commitment) and school misconduct but, contrary to social control theory and the findings of Jenkins (1997), also found that student involvement was positively associated with school misbehavior (see also Welsh, 2001). Finally, using school-specific measures of the four elements of the social bond, Stewart (2003) determined that belief in schools rules, school attachment, and school commitment were all inversely related to student misbehavior, while school involvement revealed no significant effect.

Studies that have examined school weapon carrying explicitly and have included measures of school social bonds are sparse. Some research has explored the bivariate association between in-school weapon possession and school attachment and found that adolescents who express they are happy to be at school, relative to those who report discontent, were less likely to carry a weapon to school (Kingery et al., 1999). In addition, students indicating that they have regular problems getting along with their teachers were more inclined to report carrying a weapon at school (Kingery, Coggeshall, and Alford, 1998). Among middle school students in North Carolina, however, DuRant et al. (1997) found no meaningful correlation between participation in school sports teams and weapon carrying on school property. Likewise, DuRant et al. (1999) found no association between team sports participation and carrying a gun to school but did find an inverse relationship between sports involvement and carrying a knife or club to school.

Research using multivariate methods to test the influence of school social bonds on weapon possession at school has also revealed some conflicting results. Wilcox and Clayton

(2001) discovered that students who reported greater school attachment (10-item scale) were less likely to report taking a weapon to school. Using a comparable measure, however, Wilcox Rountree (2000) indicated that school attachment (6-item scale) only explained significant variation in weapon carrying at school among students in a western Kentucky county. Similar findings did not result for students attending schools in an urban and rural county. Kodjo et al. (2003) included a measure of "school connectedness" to predict weapon carrying at school and found that it was a significant determinant for both male and female students. Conversely, Williams et al. (2002), with public school students in Illinois, found their "school meaningfulness" scale (i.e., indicator of school commitment) was unrelated to taking a handgun to school after adjusting for other covariates.

Similar to other student variables discussed thus far, making a general assertion about the influence of school social bonds on school-based weapon carrying is difficult, for research findings are limited in number and differ in ways in which a student's bond to school is measured. In general, though, results from the broader school-violence research and studies of weapon carrying suggest that indicators of school involvement (e.g., participation in school-related activities) are weak determinants of whether students carrying weapons to school. In contrast, indictors of school attachment, school commitment, and belief in school rules have shown greater consistency in predicting school violence and student weapon carrying in particular.

Fear and Victimization

A common explanation offered in the literature as to why adolescents and adults possess weapons is out of fear of victimization. Scholars have referred to this perspective as the "fear and loathing" thesis (Wright, Rossi, and Daly 1983), "fear of criminal victimization

hypothesis" (May, 1999), and "protection model" (Steinman and Zimmerman, 2003). In general, this perspective asserts that individuals are motivated to acquire or carry a weapon in an effort to dissuade potential offenders from perpetrating crimes against them, their family, or their property. Wilcox (2002) discussed how the individual acquisition or carrying of weapons for protection can be viewed as one form of self-help (see also Black, 1983; Smith and Uchida, 1988). In drawing from existing theoretical perspectives, Wilcox (2002: 149) noted that weapon possession can potentially reduce one's risk of victimization by deterring would-be offenders (i.e., deterrence theory) or by limiting perpetrators' opportunities for victimization through "increased personal guardianship" (i.e., routine activities/opportunity theory). With either perspective, however, individuals who possess weapons exclusively for self-protection would, in theory, only feel compelled to use (or threaten to use) their weapon in situations where they felt threatened by a potential offender. Within this context, therefore, weapons are not acquired or possessed for purposes of carrying out offensive, as opposed to purely defensive, activities such as armed robbery or carjacking.

The fear of victimization argument often receives cursory support in that "self-protection" is normally cited by adolescents and adults alike as a primary reason for possessing a weapon (Cook and Ludwig, 1996; Decker and Van Winkle, 1996; Hemenway et al., 1996; McNabb, Farley, Powell, Rolka, and Horan, 1996; Sheley and Wright, 1995). Regarding students specifically, prior research has revealed that many adolescents often express fear or anxiety for their safety while at school or on there way to and from school (Bastian and Taylor, 1991; DeVoe et al., 2004; National Institute of Justice, 1977; Lawrence, 1998; Martin et al., 1996); thus, a substantial number of students conceivably have reason to acquire a weapon in an effort to assure their own safety at school.

Most studies that have explored weapon possession at school have incorporated measures of students' fear and victimization experiences, but these items frequently differ in a variety of ways and consequently may be measuring conceptually distinct processes. A growing body of research has raised concerns as to how "fear of crime" is conceptualized and measured in the literature (Ferraro and LaGrange, 1987; Hale, 1996; Warr, 2000). Garofalo (1979) noted, for example, that many researchers have used a "global" measure of fear of crime in which there is no mention of crime specifically (e.g., "Do you feel safe in your neighborhood after dark?"). With respect school-associated fear, scholars also have employed similar measures. For instance, Forrest et al. (2000) used a survey item in which students were asked whether they felt unsafe in school, with no reference to a specific type of crime (e.g., physical assault).

Additional measures of school-related fear include those pertaining to the use of avoidance behaviors on the part of adolescents. That is, if students perceive their safety to be in jeopardy at school, they may refrain from participating in school-related activities that cause them to feel particularly at-risk for victimization (e.g., recess and athletic events). In addition, students may also avoid certain violence-prone areas of schools (e.g., hallways, cafeterias, and bathrooms) that lack sustained adult supervision (see Astor and Meyer, 2001; Ingersoll and LeBoeuf, 1997), for such locations are often missing capable guardians that can intervene on the behalf of potential victims. Warr (2000) referred to this type of coping behavior linked to fear as "spatial shifting" and suggested that such behavior may be a better indicator of fear than emotional or cognitive indicators. In the School Crime Supplement (SCS) to the National Crime Victimization Survey (NCVS), roughly four percent of students aged 12-18 reported avoiding one or places at school in 2003 out of fear that someone would

"attack or threaten to attack them" (DeVoe et al., 2004). The percentage of adolescents who report evading specific areas at school tends to be notably smaller than the proportion of students who express fear or concern about being at school in general (e.g., "Do you feel safe at school?").

Of course, the most foolproof way to avoid in-school victimization or alleviate school-related fear is for affected students not to attend school altogether. Although student absenteeism and dropout have been associated with a variety of individual, family, and school-related factors (see Lawrence, 1998), the CDC's Youth Risk Behavior Survey (YRBS) found that more than five percent (5.4 percent) of high school students in 2003 missed at least one day of school in the 30 days preceding the survey out of fear for their safety (Centers for Disease Control and Prevention, 2004). In general, the proportion of students who report avoiding certain places in school and missing school due to safety concerns is relatively small, but these figures closely parallel the two to six percent of students who report carrying a weapon to school in recent national surveys.

Studies that have used indicators of fear to examine adolescent-weapon carrying have revealed that such measures are generally rendered insignificant after controlling for other correlates of weapon carrying. Sheley and Brewer (1995) found, for example, that fear of violent attacks in school did not distinguish Louisiana high school students who had carried a gun (anywhere) from those who reported never carrying. Likewise, Bailey et al. (1997) indicated that middle school students' concerns over whether someone would harm or take something from them at school were statistically unrelated to bringing a weapon to school. In addition, Wilcox and Clayton (2001) discovered that adolescents who admitted to being afraid of some students at school were no more likely to possess a weapon at school than

adolescents who expressed being unafraid of their schoolmates (see also Wilcox Rountree, 2000). Contrary to these findings, Forrest et al. (2000) found that students who disclosed feeling unsafe in school were more inclined to carry a weapon to school relative to students who expressed feeling safe.

With the exception of the Forrest et al. (2000) study, however, indicators of students' reported fear of school or school victimization have, in general, proven to be weak determinants of school weapon possession. Measures of student avoidance behaviors linked to fear, on the other hand, have shown greater consistency in identifying adolescents who have reported carrying a weapon to school. The most common of these measures found in the literature are those which capture whether students have missed any days of school (within a specified timeframe) out of fear for their safety. Studies have found that such students were more likely to report possessing a weapon at school than students who have not missed school as a result of safety concerns (Coggeshall and Kingery, 1999; DuRant et al., 1997; Simon et al., 1999).

Very few studies have employed variables that account for students avoiding certain areas at school to determine whether such adolescents are more likely to carry a weapon to school. May (1999) constructed a fear of criminal victimization index that included such items as, "I am afraid to go to the school restroom at school sometimes" and "I am afraid to go to the school lunchroom sometimes." Although this index was comprised of other items unrelated to school, higher scores (i.e., greater avoidance) were significantly associated with a greater likelihood of students bringing a gun to school.

A common explanation for why some students fear for their safety at school and avoid specific locations in their schools is because of prior incidents of school victimization. Most

research concerning school weapon carrying has incorporated measures identifying students who have been the victim of property or interpersonal crime at school. Within a multivariate framework, however, indicators of whether students had property stolen or damaged at school are generally not strong predictors of school weapon possession (DuRant et al., 1997; Coggeshall and Kingery, 1999; Wilcox Rountree, 2000). With most of these property-related measures, however, it remains uncertain whether a student's property was taken from them directly or when it was unattended, such as from a locker. This distinction may prove meaningful in that possessing a weapon is likely to prove more beneficial to students in situations where a perpetrator attempts to take property from them directly. As a result, such students may feel more compelled to acquire a weapon compared to students who only had property stolen or damaged that was unattended. Combining these two forms of victimization may explain, in part, why indicators of school property crime are generally weak determinants of students carrying weapons to school (for contrary findings see Simon et al., 1999; Wilcox and Clayton, 2001).

It stands to reason that students who are the targets of physical assaults or verbal threats at school may have the greatest need for a weapon, and, with a few exceptions, research does suggest that victims of interpersonal violence in school are more likely to carry weapons to school. DuRant et al. (1997) found, for example, that students who reported experiencing greater occurrences of being threatened or injured with a weapon at school were statistically more likely to carry a weapon on school property (see also DuRant et al., 1999; DuRant, Beckford, and Kahn, 1996; Coggeshall and Kingery, 1999; Simon et al., 1999). Along these lines, Wilcox and Clayton (2001) revealed that students who admitted being threatened at school were more apt to report having a weapon on school property. Using this

same measure of victimization, however, Wilcox Rountree (2000) indicated that being threatened at school was only a significant correlate of weapon carrying at school for students in an eastern Kentucky county and not for students in a western and urban county. In addition, Bailey et al. (1997) found that middle school students who reported being robbed or attacked in school were *not* more likely to possess a weapon at school. Overall, however, measures of interpersonal victimization at school have shown a moderate level of association with student weapon possession.

It remains uncertain as to whether broader measures of interpersonal victimization are just as strong predictors of student weapon carrying as are school-specific measures. Forrest et al. (2000), with a national sample of middle school and high school students, found that students were three times more likely to report carrying a weapon to school if they had been previously stabbed (either in or outside of school) by someone. Conversely, Kodjo et al. (2003) indicated that, after controlling for other covariates, students who scored higher on a four-item victimization scale (i.e., been jumped, shot, cut or stabbed, or had a gun or knife pulled on them anywhere) were no more likely to possess a weapon at school than students scoring lower on the scale. In general, few studies have explored whether distinguishing between school and non-school incidents affects the strength of association between interpersonal victimization and school weapon carrying.

Problem Behaviors

In a comprehensive review of correlates of juvenile weapon carrying, Brown (2004: 167) concluded that there are two variables that have been consistently associated with adolescent weapon activity: gender and "involvement with crime, delinquency, and other risky behaviors." Accordingly, most studies of school-based weapon carrying have linked

student involvement in delinquency and risky behaviors to weapon possession at school, although the magnitude of this relationship has varied across studies. More specifically, school weapon carrying has been associated with student indicators of *smoking on and off school property* (Bailey et al., 1997; DuRa nt et al., 1996, 1997, 1999); *alcohol consumption on and off school property* (Bailey et al., 1997; DuRant et al., 1996, 1997, 1999; Forrest et al., 2003); *regularity of drug use during a 30-day period* (Williams et al., 2002); *number of drugs taken within 30 days* (Wilcox Rountree, 2000); *sexual activity* (Coggeshall and Kingery, 1999); *physical fighting on and off school property* (Bailey et al., 1997; Coggeshall and Kingery, 1999; DuRant et al., 1996, 1997; Forrest et al., 2000; Kodjo et al., 2003; Simon et al., 1999); *prior arrest* (Williams et al., 2002); and *gang involvement* (May, 1999; Williams et al, 2002).

The strength and consistency of these findings have led some scholars to conclude that adolescent weapon carrying may be viewed as an extension of other forms of delinquency or problems behaviors (e.g., Simon et al., 1999). Moreover, these findings have correctly called into doubt "the image of otherwise law-abiding youths carrying guns solely for protection" (Webster et al., 1993: 1607). Namely, existing research clearly suggests that weapon possession among adolescents is connected more to delinquency and aggression than to entirely defensive behaviors (Page and Hammermeister, 1997), although conceptualizing weapon carrying as either a defensive behavior (i.e., fear of victimization argument) or an offensive behavior (i.e., to facilitate the completion of criminal activities) is not likely accurate. Consider the remarks of Brown (2004: 170) for example:

> *…although there is a valid justification for differentiating between juveniles who carry weapons for legitimate reasons and juveniles who carry weapons for crime-*

> *related reasons, the extant literature suggests that the distinction between juvenile weapon carrying for offensive and defensive crime-related reasons is redundant because, in most cases, the two are intertwined.*

In other words, it is often noted that the individuals most in need of possessing a weapon for purposes of self-protection, especially handguns, are the very same persons most likely to be involved in criminal and delinquent activities (see e.g., Wright and Rossi, 1986; Sheley and Wright, 1995).

SCHOOL EFFECTS

In summarizing the "school effects" research, Denise Gottfredson (2001: 81) began by posing the question, "Does school matter?" Her abbreviated response to this question was simply "Yes." Most persons, especially parents, would likely concur with this conclusion in that schools develop reputations as being effective or inept institutions based on the academic performance and behaviors of their respective student bodies. But as Gottfredson (2001) has pointed out, some early research that examined the influence of schools on student outcomes (e.g., dropout and educational aspirations) did not generate convincing support for the belief that schools matter. The seminal Coleman Report, for example, involved a national study of more than 600,000 students in 4,000 schools and, among other things, explored what effect school characteristics have on academic achievement (Coleman, Campbell, Hobson, McPartland, Mood, Weinfeld, and York, 1966). In general, one of the key findings from the report was that differences in student and school achievement were predominantly explained by the social composition (e.g., race) of schools and family background characteristics of students (e.g., socioeconomic status), as opposed to specific aspects of schools such as size,

expenditures, curriculum, and teachers' training (see also Jencks, Smith, Ackland, Bane, Cohen, Gintis, Heyns, Stephen Michelson, 1972; Moynihan and Mosteller, 1972).

More recent studies of the influence of school context on student performance and behavior have proven more fruitful in isolating school effects. Unfortunately, however, few of these studies have attempted to identify whether school characteristics have an effect on school or student-level delinquency or misbehavior (Welsh, 2000; Welsh, Stokes, and Greene, 2000). As Stewart (2003: 580) noted, "This oversight is unfortunate, since the school environment is one of the most important environments in which children are socialized." Astor and Meyer (2001: 378) attribute this oversight, in part, to violence often being viewed as a consequence of "a cognitive or behavioral deficit" of the student in psychology and education. Accordingly, Astor and Meyer point out that most school violence prevention programs that are regularly implemented are premised on the assumption that violence results from individual or student characteristics (e.g., lack of conflict resolution skills) and not conditions specific to schools.

Studies that have focused on student or school-level delinquency or misconduct, however, have examined a wide variety of outcomes such as school suspension, class cutting, fighting, weapon carrying, student and teacher victimization, police incident data of school crimes, petty crime, student perceptions of safety, and student avoidance behaviors (Baerveldt, 1992; Bryk, Lee, and Holland, 1993; Hellman and Beaton; 1986; Gottfredson, 1979; Gottfredson and Gottfredson, 1985; Stewart, 2003; Welsh et al., 2000; Welsh, Greene, and Jenkins, 1999; Wilcox and Clayton, 2001). Gottfredson (2001) noted that the magnitude of school effects among such studies, as well as studies examining academic outcomes, could be considered moderate.

Among multilevel studies in particular, Gottfredson (2001) found that the variance in student-level outcomes attributable to school-level characteristics ranged from 8 to 15 percent, although other studies have found considerably smaller effects (e.g., Birnbaum, Lytle, Hannan, Murray, Perry, and Forster, 2003). This range in variance suggests that the magnitude of school effects is sensitive to some degree to the student-level outcome(s) being examined. It is therefore difficult to summarize what overall effect school-level characteristics have on student delinquency or misconduct because of the noted variability in how such outcomes have been measured (e.g., ranging from class cutting to serious forms of delinquency). But in her review of the school effects literature, Gottfredson (2001: 82) concluded that "…[school] 'compositional' effects appear to matter more than other school characteristics [e.g., school size] and more for noncognitive outcomes such as attendance, dropout, and school misbehavior than for academic achievement…"

Theoretical Arguments and School Context

In general, two theories have served to guide arguments concerning the influence of social context on student and school-level delinquency or misbehavior: social disorganization theory and theories of school climate (see e.g., Stewart, 2003; Wilcox and Clayton, 2001; Welsh, 2000; Welsh et al., 1999, 2000). Schools are embedded in communities, and social disorganization theory underscores how neighborhood or community conditions *external* to schools can affect levels of school violence; an issue addressed further in the next section. It is also the case, however, that arguments of social disorganization theory can been used to identify how *internal* characteristics of schools affect student and school-level outcomes. The application of social disorganization theory to schools is facilitated by the perspective that schools should be viewed as *communities* as opposed to *organizations.* As Furman (2002: 1)

noted, “Central to this argument for community is that relationships become the focus in schools when they are thought of as communities rather than organizations” (see also Battistich et al., 1995; Sergiovanni, 1993). Byrk et al. (1993: Chap. 5) combined these terms in describing how Catholic schools as “communal organizations” often provide a unique environment for their students.

Fundamental to this community argument is that effective schools foster an atmosphere in which students, teachers, and administrators alike feel a sense of belonging, as opposed to feeling alienated, while at school (Furman, 2002). Feelings of acceptance at school are often formed through the development of strong interpersonal relationships among its members. This emphasis placed on social integration, of course, closely parallels recent extensions of social disorganization theory that stress the importance of social ties among neighborhood residents in order to regulate the behaviors of other community members (Bursik and Grasmick, 1993; Sampson and Groves, 1989; Sampson, Raudenbush, and Earls, 1997). In keeping with these arguments, schools comprised of student bodies in which segments of the student population feel socially isolated or alienated while at school are likely associated with higher levels of school delinquency compared to more socially integrated schools (see e.g., Gottfredson and Gottfredson, 1985). Furthermore, with the schools-as-communities perspective, there is an obvious presumption that the level of student cohesion in schools is not entirely determined by the level of citizen cohesion in the communities in which they serve (i.e., attendance areas); a presumption that has not been the focus of much empirical research. As Bryk et al. (1993) indicated, however, a large body of education research highlighted the importance of school context by way of identifying effective schools

in disadvantaged areas, which suggests, in part, that school effectiveness is not totally a function of conditions beyond the control of schools.

Consistent with this argument, Welsh et al. (1999: 79) noted that there is developing understanding that schools have their own distinctive "personalities" much like individuals, and the personality of a school is often synonymous with "school climate." School climate is a broad term that has come to encompass many facets of schools, but Anderson (1982) recognized four distinct dimensions of school climate in a review of the literature: ecological environment, social milieu, social system, and culture. Indicators of the *ecological environment* commonly pertain to physical aspects of the school such as size, orientation (i.e., private vs. public), and level (i.e., middle schools vs. high schools). There arguably has been no school-level measure that has received as much empirical attention as *school size*; a characteristic that continues to garner much interest due to the national trend of consolidating school districts (see Cotton, 1996**;** Slate and Jones, 2005). Conceptually, larger schools are considered to have more difficulties monitoring and supervising the behaviors of students and thus more disciplinary problems result as a consequence (Flaherty, 2001; Hellman and Beaton, 1986; Lawrence, 1998; Toby, 1983). Findings have been generally mixed regarding the influence of school or classroom size on academic performance (Anderson, 1982), however, and studies of school disorder have been no different in reporting inconsistent results concerning the impact of school size (e.g., *compare* Bryk et al., 1993; Gottfredson and Gottfredson, 1985; Stewart, 2003; *with* Benbenishty and Astor, 2005; Felson, Liska, South, and McNulty, 1994; Lee and Croninger, 1996; Olweus, 1993; Schreck and Miller, 2003; Welsh et al., 1999, 2001).

Studies that have examined the influence of *school level* or *orientation* on disorder are sparse, for studies of school context generally use samples comprised of only public school students and seldom contain adolescents from both middle schools and high schools. Using a subset of Catholic and public high schools from a nationally representative sample, however, Byrk et al. (1993) found a statistically significant "Catholic school effect" on a variety of teacher and student outcomes, such as teachers' reports of classroom disorder, after adjusting for individual and school characteristics. Based on these findings, as well as others, Bryk and colleagues argued that this Catholic school effect could not be entirely attributed to the "selectivity argument"; that is, credited to preexisting differences in the sociodemographic makeup of Catholic and public high schools. Furthermore, Lee and Croninger (1996), with a national sample of high school students, found in multivariate analyses that students who attended Catholic or non-parochial private schools were less likely than public school students to report feeling unsafe in their respective schools. These findings, although limited in number, suggest that social dynamics or characteristics specific to private schools may serve to reduce the occurrence of problem behaviors or perceptions of disorder among their respective student bodies relative to public schools.

It is not uncommon to find with national data that younger students (grades 6-8) report experiencing victimization at school, in particular bullying, more often than high school students (Bastian and Taylor, 1991; Chandler, Chapman, Rand, and Taylor, 1998; DeVoe et al., 2004), yet few studies have examined the effect of *school level* on misbehavior or disorder. In their reanalysis of national data from the Safe School Study, Gottfredson and Gottfredson (1985) conducted separate multivariate analyses for junior and senior high schools in examining rates of student and teacher victimization. Although in many instances

significant school-level predictors were similar for junior and senior high schools (e.g., perceived fairness and clarity of rules), there were also notable differences in covariates across the regression models for the two levels of schools (e.g., teacher democratic orientation). Hellman and Beaton (1986) reported comparable disparities in conducting separate analyses for Boston middle schools and high schools in predicting suspension rates; that is, correlates of suspension rates were sensitive to school level.

Following a similar analytical strategy, Benbenishty and Astor (2005) conducted separate multilevel analyses for 232 primary (i.e., elementary) and secondary schools (i.e., middle school and high schools) located in Israel. This research also examined three types of student-level victimization: *verbal* (e.g., student cursed you or mocked you, but no threats of harm), *moderate* (i.e., student threats of harm), and *physical* victimization. In the regression models with primary schools, a school level dummy variable was included that distinguished middle schools and high schools. This variable accounted for 15 percent of the adjusted between-school variance in verbal victimization, 18 percent in moderate victimization, and 3 percent in severe victimization, respectively. With each outcome, students attending middle schools were significantly less likely than high school students to report experiencing victimization at school. Notably, however, Wilcox and Clayton (2001) found no school level effect, after adjusting for other correlates, when examining school-based weapon carrying across middle schools and high schools in Kentucky. This finding aside, evidence does suggest that unique social dynamics may be at work in middle schools and high schools that influence students in different ways.

Aside from the ecological environment, another dimension of school climate mentioned by Anderson (1982) included the school *social system*. Indicators or measures of

the school social system include items pertaining to social dynamics such as the quality of teacher-student relationships and student-student relationships. The quality of these relationships at the student-level would be considered indicators of the school social bond, and, as noted, such measures are often associated with adolescent delinquency or misbehavior. When these relationship measures are aggregated to the school level, on the other hand, they serve as a measure of the level of interpersonal cohesion among members of a school.

Benbenishty and Astor (2005) found that primary and secondary schools in which students perceived teacher support to be greater (school-level variable) were less likely to have students report experiencing school victimization. Stewart (2003) used a school-level of measure of cohesion that addressed the level of positive interaction among students, teachers, and administrators in examining student misbehavior. This measure, however, was unrelated to school misbehavior, but the contextual variables of school location (urban schools) and school size (larger schools) were determined to be significant correlates of student-level misconduct. Here again, however, few studies have examined the influence of school contextual variables on school misconduct, and given the importance of social cohesion or integration in theories of school climate and social disorganization, further exploring the effects of school interrelationships on student misconduct would be beneficial.

With respect to this research, one objective is to identify potential *school-level* effects on *student-level* weapon carrying at school. To my knowledge, there has been one empirical study conducted that has examined the impact of school contextual variables on in-school weapon possession: Wilcox and Clayton (2001). In this study, individual and school-level determinants of weapon carrying were examined across 21 middle schools and high schools in

one Kentucky county. Notably, the researchers *did* find significant variability in school weapon carrying across the schools. Furthermore, most of the student-level characteristics (e.g., SES, problem behavior, and school victimization) were significant predictors of in-school weapon possession, but *none* of the six school-level variables examined were statistically significant when modeled simultaneously. A measure of school SES (i.e., proportion of students eligible for a free lunch) was significant, however, when the contextual variables of "school deficits " and "school capital" were omitted from the regression model.

In the end, Wilcox and Clayton (2001) noted that most of the variability in school-based weapon carrying was accounted for by student-level characteristics, which left limited variability across schools for school-level measures to explain. In addition, these scholars mentioned that one of the limitations of the study was that findings were based on data from a sample of schools from one Kentucky county, which raises the issue as to whether or not "…these findings can be generalized to students in schools in other cities and other regions of the country" (p. 535). This limitation will be overcome in this research through the use of a nationally representative sample of high schools.

COMMUNITY EFFECTS

Hellman and Beaton (1986: 107) noted that "The basic question concerning violence and disruption in the schools is whether it is a reflection of community problems and crime causes, or is more a function of the internal characteristics of the schools." As Laub and Lauritsen (1998) indicated, conventional wisdom holds that it is former rather than the latter; that is, that school violence and disorder is more a result of community conditions beyond the immediate control of schools. This position represents the "importation" or "spillover" argument. Sheley et al. (1992: 681) offered support for this argument in their own research,

for example, by concluding that "…violence in and around schools is not predicted by factors inherent in the school environments themselves; rather, violence spills into the schools from the world outside."

Welsh et al. (2000: 253) noted some of the ways in which community conditions can influence levels of school violence: by increasing students' exposure to violence on the way to and from school; "through the importation of norms and behaviors conducive to the use of violence to resolve disputes;" and by weakening the level of informal social control exerted in neighborhoods in which schools are located. Furthermore, in a reformulation of the systemic model of social disorganization theory, Bursik and Grasmick (1993) highlighted three processes of social control that can be exercised at the neighborhood level: private, parochial, and public control (see also Hunter, 1985). Parochial control refers to the level of interconnectedness between residents of a community and their local institutions such as schools. Within the framework of the systemic model, socially disorganized communities generally have weak relational networks among residents that result in less interaction with local institutions. As a consequence, institutions such as schools are less effective in exercising control over its members. Conceptually, therefore, much research has attended to (either directly or indirectly) the potential importance of community characteristics in explaining school violence or disorder, but few studies have addressed this matter empirically (Laub and Lauritsen, 1998; Gottfredson, 2001; Welsh et al., 1999, 2000).

The lack of research examining the effects of community conditions on school violence is unfortunate for a number of reasons, but the primary reason likely pertains to the potential policy implications of such research. Consider the comments of Lawrence (1998: 5), for example, if it is determined that "…school crime is primarily a reflection of crime in

the community, then relying on improved teaching and discipline may not significantly reduce levels of school crime." McDermott (1983: 278) made similar arguments 15 years earlier in stating that "…reliance on solely school-related interventions may not significantly lower levels of school crime, especially if crime in schools is a reflection of crime in the community." The importation argument, therefore, ultimately questions the use of school-based initiatives or interventions that attempt to *only* manipulate internal conditions of schools. Notably, the implementation of such programs has become quite common in many schools throughout the country (see e.g., Gottfredson, 1997; and Gottfredson, Wilson, and Najaka, 2002 for a review).

With regard to school-based weapon carrying, there is no obvious reason to presume that adolescent weapon carrying at school would be impervious to surrounding community conditions. In fact, there is reason to argue just the contrary in that the incidence of in-school weapon carrying is likely sensitive to characteristics external to schools. It is well understood, for example, that one's risk of victimization varies based on where they reside. In 2002, for instance, DeVoe et al. (2004) found that, compared to students who resided in suburban or rural areas, the rate of violent victimization *away from school* was greater for urban students ages 12-18. Within the context of the fear of victimization perspective, this finding suggests that urban students may have a greater need or motivation to carry a weapon to school in recognition of their elevated risk of victimization before and after school and not necessarily during school, for as Elliot et al. (1998) pointed out, schools serve as relatively safe places for some adolescents relative to their homes, neighborhoods, or communities.

There is often a presumption that when students report "carrying a weapon to school" they do so for purposes or conditions entirely related to school (e.g., being tormented by other

schoolmates), but there is at least some reason to question this presumption. Available data from the National Incident-Based Reporting System (NIBRS) indicates, for instance, that during school days violent crimes committed by juveniles with firearms are most likely to occur in the time period immediately after school (around 3:00 p.m.) (Snyder and Sickmund, 1999). Accordingly, in order for students to have a weapon readily available after school, they may feel compelled to carry a weapon with them to school. In applying this logic, students could bring weapons to school in preparation for events that occur after school hours. In addition, students who are released from school and return to socially disorganized or high crime communities are likely to have a greater need to bring a weapon to school in preparation for potential risks immediately following school. Thus, "school" weapon carrying may have more to do with social conditions or the environment external to schools rather than internal to schools (i.e., spillover hypothesis).

Some research has examined the level of association between community characteristics and school violence or disorder. In their reanalysis of data from the Safe School Study, for example, Gottfredson and Gottfredson (1985) examined victimization rates for students and teachers across 642 junior and senior high schools. These data were combined with indicators of school community (e.g., urbanicity and unemployment) and school (e.g., security measures and school composition) characteristics. Gottfredson and Gottfredson found that rates of student victimization for junior high schools were associated with the level of poverty, unemployment, and female-headed households in the school community, while student victimization rates for senior high schools were linked more to the level of crime in school communities. Gottfredson (2001: 71) noted that this study found that "…the community context in which the school operates and the average demographic

characteristics of the students enrolled in the school [which are largely a reflection of community demographic characteristics] are the best predictors of the school's level of disorder, but that characteristics of the way the school is organized also contribute to the level of disorder."

Interestingly, Hellman and Beaton (1986) examined the level of variability in suspension rates across Boston middle schools and high schools and found that middle school suspension rates were more a function of internal characteristics of schools (e.g., the ratio of students to teachers), while high school suspension rates were more connected with external characteristics of schools (e.g., crime rate of school district). This finding suggested that, relative to high schools, the environment of middle schools was able to overcome the negative influences of external community conditions.

Lab and Clark (1996) undertook a study of students in 44 junior and senior high schools in Lucas County, Ohio (Toledo). They gathered survey data from students, teachers, and principals as well as collected observational, census, and official crime data for the areas surrounding the schools. In general, the study found that schools which institutionalized "humanistic policies," relative to coercive ones, were less likely to be associated with high levels of in-school victimization. Notably, however, bivariate analyses revealed that most measures of school community characteristics (e.g., police arrest data for property and personal crimes) were not significantly associated with the prevalence of in-school victimization across schools (see also Clark and Lab, 2000). Baker, Mednick, and Carothers (1989) reported comparable findings with a sample of eight high schools in Los Angeles. This research found that students' reports of in-school victimization (both violent and theft) were *not* significantly related to the arrest rate of the school attendance area.

Welsh et al. (2000) suggested that one potential reason research has found differing effects of community characteristics on school disorder is because of how "school community" is measured or defined (see also Welsh et al., 1999). In the research noted above, for example, Gottfredson and Gottfredson (1985) indicated that not all of the community data for each of the schools in the Safe School Study represented equivalent geographic areas. Hellman and Beaton (1986) used school community data aggregated to the school district level, while Lab and Clark (1996) examined community conditions within "a one-quarter mile radius" of the participating schools.

Importantly, in their study of school disorder across 43 middle schools in Philadelphia, Welsh et al. (2000) distinguished between the "local" school community and the "imported" school community. Measures of the local school community referred to census tracts within one-quarter mile of each school building, while measures of the imported school community pertained to the census tracts in which the school's students actually resided. Independent variables used to predict school disorder in the study included measures of community poverty, residential stability, and crime as well as the school indicators of size and stability. Results revealed that community crime had no significant effect on school disorder in both the local and imported school community models, while community poverty only influenced disorder through its effect on school stability. Based on these findings, Welsh and colleagues (2000) concluded that school institutional processes influence levels of school disorder, and thus schools in high crime communities do not automatically experience high rates of disorder.

These abovementioned studies each represent cases in which school community variables were used to predict *school-level* victimization or disorder. Of particular interest for

this research, however, are studies that have identified the effects of school community conditions on *student-level* delinquency or weapon carrying at school. At least one study has explored the influence of community context on adolescent weapon carrying *anywhere*. Using data from the Project on Human Development in Chicago Neighborhoods (PHDCN), Molnar et al. (2004) examined what influence five measures of neighborhood context had on whether adolescents aged 9 to 19 *had ever* carried a "concealed or hidden gun anywhere." The prevalence for concealed firearm carrying among the roughly 1,800 youths residing in 218 Chicago neighborhoods was three percent. The neighborhood-level factors of unsafe for children to play, collective efficacy, social disorder, and physical disorder were introduced into multilevel models separately (due to multicollinearity), while controlling for neighborhood-level poverty and individual/family-level factors. With the exception of concentrated poverty, each of the neighborhood measures exerted a significant effect on concealed firearm carrying at the individual level.

Welsh et al. (1999) undertook a study that concurrently tested for contextual school and community-level effects on student misconduct in 11 Philadelphia middle schools. Here again, a distinction was made between the imported school community and the local school community with the school community variables, and separate multilevel models were estimated for each group of these school community measures. The school community factors that were examined included poverty, stability, and serious property crime, while the school characteristics examined were total enrollment and attachment. Findings from the imported community and local community models revealed that the only contextual measure associated with student misconduct was community poverty. Overall, the contextual-level

predictors accounted for roughly four percent of the total explained variance in student misconduct.

In further extending the work of Welsh and colleagues (1999), Benbensishty and Astor (2005) undertook a comprehensive study of roughly 15,000 students in grades four through eleven who were attending 232 Israeli schools. One objective of the research was to examine what effect school community characteristics have on student-level victimization (verbal, moderate, and physical victimization) at school, after adjusting for individual and school-level factors. Separate multilevel models were estimated for primary (i.e., elementary) and secondary (i.e., middle and high) schools with each of the three types of in-school victimization (see Table 10.4: 119). With respect to findings for primary schools in which the outcome was severe victimization, the study found strong support for school community effects. For example, the level of unemployment, education, family poverty, and overcrowding in the school community were each significantly associated with severe in-school victimization. In fact, of the 19 internal and external school-level factors examined, only two (i.e., school size and level of student participation) were not meaningfully related to severe victimization. Overall, the findings of Molnar et al. (2004), Welsh et al. (1999), and Benbenishty and Astor (2005) suggest that much like weapon carrying in general; in-school misconduct; and in-school victimization school weapon carrying is likely affected by community characteristics.

SUMMARY

This chapter provided an overview of student, school, and community-level characteristics associated with in-school misconduct in general and in-school weapon carrying more specifically. In most instances, research has examined these levels of analysis

individually, as opposed to examining their collective or simultaneous effects on in-school misbehavior (Welsh et al., 1999). In reviewing the school effects literature, Gottfredson (2001) noted one consequence of this fragmented approach is that school research often provides only a combined effect of schools and communities on student misbehavior, for no effort is made to account for the larger environmental conditions in which schools operate. Using the Add Health data, this study overcomes this limitation by examining each of these levels of analysis—student, school, and community—effects on school-based weapon possession. Accordingly, the analytic framework employed in this research is more consistent with recent studies conducted by Welsh and colleagues (1999) and Benbenishty and Astor (2005).

Most measures of *student* attributes or characteristics examined in this research fall into one of the five categories of individual-level variables addressed in this chapter: (1) sociodemographic characteristics; (2) family structure and relationships; (3) academic performance and school attachment; (4) fear and victimization; or (5) problem behaviors. Although these student-level variables are not the primary focus of this research, there are a number of questions and inconsistencies that remain unresolved regarding the influence of some student-level variables on school weapon carrying. That is, with the exception of gender and involvement in problem behaviors, few other student characteristics have demonstrated uniform effects on school weapon carrying across studies. For instance, the strength of association between variables like student SES, student-parent(s) relationships, academic performance (e.g., GPA), student fear, and school weapon possession remain unclear. Particular attention is paid, therefore, to whether such student characteristics are

meaningfully related to in-school weapon carrying and thus consistent with, or contrary to, prior research.

It was noted in this chapter that two theories have generally served to guide arguments concerning the influence of schools on student behavior: theories of school climate (Anderson, 1982) and the schools-as-communities perspective (Payne et al., 2003). The *school* variables explored in this research are in line with these theories. Regarding theories of school climate, Anderson (1982) identified four distinct dimensions of school climate, and these dimensions are explored in this research. These dimensions include school measures of the *ecological environment* or *milieu* (e.g., school size) and *social system* or *culture* (e.g., involvement in parent-teacher association). Some measures of a school's social system or culture can also serve as variables testing arguments of the school-as-communities perspective, for with each perspective, a particular emphasis is placed on the quality of interactions among students, school personnel, and parents. In this research, therefore, it is examined to what extent measures of a school's ecological environment/milieu and social system/culture influence in-school weapon carrying.

With respect to the community context, three variables—economic disadvantage, residential mobility, and violent crime—are examined in this research that account for the environmental conditions of a school's attendance area. Research was discussed in this chapter that found a significant association between external community conditions and in-school victimization and offending. For example, Welsh and colleagues (1999) found that community poverty was significantly associated with in-school misconduct, while Benbensishty and Astor (2005) found a number of significant relationships between community context and in-school victimization. This research specifically examines whether

measures of a school's external environment meaningfully affect its level of student weapon possession.

The next chapter proceeds by extensively addressing the data, variables, and analytic strategy employed in this research in order to isolate the effects of student, school, and community characteristics on school-based weapon carrying. Following a discussion of the data, variables, and analytic strategy, chapter four thoroughly outlines the hypotheses tested in this research and then proceeds to present findings that address these hypotheses and the effects of the study variables on school weapon possession.

CHAPTER 3

DATA, VARIABLES, AND ANALYTIC STRATEGY

DATA

The issues raised in the previous chapters are addressed with restricted-use data from the National Longitudinal Study of Adolescent Health (Add Health). The Add Health study was designed to examine how various social contexts concurrently affect the health and risk behaviors of adolescents. Add Health data were gathered using a two-stage cluster sampling technique. In the first stage, 80 high schools were selected from a list of all U.S. high schools sorted by region, urbanicity, size, school type (i.e., private, public, or parochial), and racial composition. From these sorted clusters, a high school was eligible for the Add Health sample if it contained an 11th grade and enrolled at least 30 students, with the probability of selection being proportional to school size. The 80 selected high schools were then asked to identify middle schools from which students were drawn, and, for each high school in the sample, one middle school was recruited to participate in the Add Health study. More specifically, the probability of a middle school being selected was proportional to the percentage of a high school's entering freshman class that came from the middle school.

This selection process resulted in a nationally representative sample of 132 middle schools and high schools nested in 80 communities.[3] In each of these schools, all students in grades 7 through 12 were eligible to complete an in-school questionnaire administered on a single day during the 1994-1995 school year; thus, there was no sampling of students within

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[3] There are a few reasons why the final sample does not include 160 schools (i.e., a middle school and high school from each community). First, four of the high schools received students from a number of middle schools and so no feeder school was selected. Second, 20 high schools served as their own middle school for they housed a seventh or eighth grade. And finally, four of the selected middle schools did not agree to participate in the study. Therefore, the number of middle schools in the final sample was reduced from 80 to 52 (Tourangeau and Shin, 1999).

participating schools.[4] Overall, there were more than 90,000 students who completed in the in-school survey. Along with the student component, an administrator from each of the 132 schools was asked to fill out a questionnaire concerning various characteristics of their respective institution (e.g., student attendance levels).

The second stage of the sampling design involved schools providing student rosters in order to select adolescents to complete an in-home interview.[5] A total of approximately 27,000 students in grades 7 through 12 were selected to complete the wave 1 (1995) in-home interview, which, on average, was administered six months after the in-school survey. In most instances, a random sample of 200 students from each community was selected to complete the wave 1 in-home interview. However, the combination of *over-sampling* of select populations—including physically disabled adolescents; African Americans from highly educated families; and saturated samples (i.e., all students from 14 schools were selected)—and *differential response* resulted in an unequal number of students participating across schools. In total, there were 20,745 adolescents who completed the wave 1 in-home interview in 1995 (see Harris, Florey, Tabor, Bearman, Jones, and Udry, 2003 for a detailed description of the Add Health study design).

A defining and particularly attractive characteristic of the Add Health study is the availability of extensive contextual data. The home addresses of participants of the wave 1 in-home interview were identified and then geocoded in order to link them to contextual data sources. Most of the contextual variables were measured at the county level (e.g., UCR crime

[4] For instance, instead of sampling a predetermined number of students within each participating high school (e.g., 50), all students in grades 7 through 12 were eligible to take the in-school questionnaire if they were present on the day it was administered. Depending on the size of a school, therefore, there could be a great deal of variability in the number of students who completed the in-school questionnaire from one school to the next in the sample.

[5] A student did not have to complete an in-school questionnaire in order to be eligible to take part in the in-home component of the Add Health study. With the exception of a few select populations, participation in the in-home interview, therefore, was *not* dependent on completing the in-school survey.

and arrest data), while data from the 1990 Census of Population and Housing is available at the state, county, tract, and block group levels. The contextual measures are accompanied by "grouping" variables that permit one to identify adolescents who reside in the same state, county, census tract, or block group. In the case of states and counties, these grouping variables are *not* Federal Information Processing Standards (FIPS) codes. Thus, the geographical grouping variables are unique to the Add Health study due to concerns of deductive disclosure (see Billy, Wenzlow, and Grady, 1998 for a detailed description of the Add Heath contextual data).

Response Rates

Of 80 high schools originally selected to administer the in-school survey, 52 (65 percent) agreed to take part in the Add Health study. The remaining 28 high schools that refused to participate were replaced by similar schools based on eight characteristics (e.g., size and racial composition; Tourangeau and Shin, 1999). Only four of 56 initially selected middle schools (7 percent) declined to participate in the study.

Unfortunately, there is no current Add Health documentation available that describes basic school characteristics associated with refusal to participate.[6] But Gottfredson and colleagues (2000), in using data collected during the 1997-1998 National Study of Delinquency Prevention in Schools, examined school characteristics correlated with study participation among a national sample of primary and secondary schools. They found that, with respect to administering student surveys, high schools located in urban areas or that served less educated districts (based on a school's zip code) were less likely to participate in the study. Interestingly, high school participation was *not* associated with the racial composition of a school or the percentage of households headed by females in the broader

[6] E-mail correspondence with Joyce Tabor (Add Health data manager) on February 2, 2006.

school community. In generalizing these findings to the Add Health study, it seems probable that urban schools serving undereducated districts were less likely to cooperate. But as noted, some of these non-response characteristics detailed by Gottfredson et al. (2000) were used in selecting replacement high schools (e.g., urbanicity) in the Add Health study, which likely served to improve the broader representation of the data.

The average participation rate for the in-school survey across the middle schools and high schools was approximately 76 percent (Swahn, Hamming, and Ikeda, 2002). *Passive* parental consent for the in-school survey was initially approved by an Institutional Review Board (i.e., an adolescent was only excluded from the survey if a guardian objected to their participation), but 10 schools (8 percent) in the Add Health study required *active* parental consent (i.e., a guardian had to consent to their child's participation). Extant research indicates that, relative to passive parental consent procedures, active parental consent adversely affects the composition of a sample (Anderman, Cheadle, Curry, Diehr, Schultz, and Wagner, 1995; Ellickson and Hawes, 1989; Esbensen, Miller, Taylor, He, and Freng, 1999). For instance, with a sample of middle school students attending 18 schools in five U.S. cities, Esbensen and colleagues (1999) found that active parental consent introduced selection bias because parents of "at-risk youth" were less likely to return consent slips which allowed students to participate in the study. Such potential selection effects could not be examined with the Add Health data, but it is interesting to note that larger urban schools were more apt to require active parental consent in order to allow their students to complete the in-school survey. Of course, these are the very same schools that are most likely to serve particularly "at-risk" youth.

Certainly the Add Health data were not exempt from selection effects introduced by active parental consent procedures, but the average participation rate (76 percent) across schools for the in-school survey is consistent with response rates found in other national school-based samples.[7] For purposes of this research, student responses provided on the in-school survey were aggregated to create contextual measures of the school environment (e.g., social disorder). One strength of these aggregate measures is they were constructed from data which attempted to survey *all* students in grades 7 through 12 from each school, as opposed to surveying a predetermined number of students (e.g., 50 respondents). Thus, these school-level measures likely serve as fairly accurate indicators of a school's environment.

A school administrator from each of the participating schools was also asked to complete a questionnaire at the time of the in-school survey, and, similar to responses provided by adolescents on the in-school survey, information supplied by school administrators was used to create measures of school-level characteristics (e.g., level of adult participation in parent/teacher association). Out of 132 schools, only two schools (less than 2 percent) did not have an administrator complete a questionnaire. Thus, the response rate among school administrators was particularly high, which is not surprising given that these very same administrators who allowed their students to take part in the Add Heath study.

Each of the *individual* or *student-level* variables examined in this research (including the outcome variable) were created from adolescent responses gathered during the wave 1 in-home interview. As mentioned, roughly 27,000 students were initially selected from school rosters to participate in the in-home interview, and of these students, 20,745 (78 percent) actually completed the interview. As was the case with response issues previously raised,

[7] For example, in a national sample of 310 secondary schools, Gottfredson et al. (2005) reported an average within-school response rate of 75 percent for a student survey.

there is no Add Health data or documentation available that specifically examines adolescent characteristics associated with nonparticipation in the wave 1 in-home interview. But based on prior arguments raised concerning obtainment of active parental consent, it seems probable that the 6,000 non-participants of the in-home interview were *not* a random subset of the adolescents who did complete the in-home interview. In other words, "at-risk youth" (e.g., urban minorities from single-parent families) were likely overrepresented among non-participants. Although there is no simple solution to this shortcoming, sample weights are available in the Add Health data that compensate for differential participation and response.

STUDY SAMPLE

Eligible High Schools

Findings presented in this research were generated from a subset of cases available in the Add Health data. This research sample was created through the use of selection filters which systematically removed cases from the study. The most important of these selection criteria was limiting the sample to *high schools*. The removal of middle schools from the research sample was done for conceptual as well as empirical reasons.

Some research has found notable differences in the explanatory measures that best account for variability in student disciplinary and victimization outcomes across middle schools and high schools (see e.g., Gottfredson and Gottfredson, 1985; Hellman and Beaton, 1986). Stated differently, while variable *x* was significant in predicting outcome *y* across high schools, this relational finding was not replicated across middle schools. Such incongruent findings suggest that social processes unfold differently among students in high schools relative to middle schools. One reason this may occur is because middle schools are generally more homogenous than high schools, for they receive students from fewer geographical areas

and thus are more neighborhood-based than high schools. Accordingly, social processes unfolding among students and staff in high schools are theoretically more dynamic than in middle schools because of greater within-school variability in the composition of students and staff. These arguments clarify, in part, why some scholars have elected *not* to examine school-based outcomes across a combined sample of middle schools and high schools (e.g., Gottfredson and Gottfredson, 1985). As mentioned, a similar approach was utilized in this research by limiting analyses to high school students.

A defining characteristic of this research is the inclusion of community variables (e.g., economic disadvantage) to examine school-based weapon carrying. The measurement and analysis of these variables, however, is potentially problematic if undertaken with a combined sample of middle schools *and* high schools from the Add Health study. A model-based analytical approach (i.e., two-level hierarchical model) was employed in this research which aggregated measures of students' residential areas (i.e., census tract data) to the school level; thus creating school-level measures of a school's attendance area. Of course, these aggregated measures are strongly correlated in cases where a middle school and high school serve the same community, for they have overlapping attendance areas. Empirically, this clustering of attendance areas can affect variance statistics (e.g., standard errors and confidence intervals) by underestimating their true values, which increases the probability of uncovering statistically significant findings when in effect they are not existent (i.e., Type I error). Therefore, based on the conceptual and empirical arguments raised, the study sample includes *only* high schools.

The high school selection filter reduced the number of eligible schools in the research sample from 132 to 80. Notably, the Add Health study classified a school as a "high school"

if it contained an eleventh grade, but some of these 80 "high schools" also housed elementary or junior high students. These schools essentially served as one of their own "feeder" schools. For example, nine schools in the Add Health sample contained students in kindergarten through twelfth grade. Returning to the conceptual arguments raised above, it seems reasonable to contend that, relative to schools comprised entirely of high school students (e.g., grades 9 through 12), social processes or dynamics may develop differently in schools housing students from a much larger grade range (e.g., K through 12). Mindful of these potential differences, this research removed high schools from the sample that also housed elementary or junior high students with one exception. One school in the current research sample is comprised of students in grades 8 through 12, with the remaining high schools housing students in grades 9 through 12 or 10 through 12.

The final selection filters used to retain schools in the current sample were that a high school must have administered the in-school questionnaire to its students *and* also had a school administrator complete a questionnaire. Four high schools in the Add Health study provided school rosters in order to select students to participate in the in-home interview *but* refused to administer the in-school survey. These schools were removed from the study sample because student responses to the in-school survey were needed in order to create aggregate measures of the school environment (e.g., social disorder). Responses from the school administrator questionnaire were also used to create school-level measures, and, fortunately, an administrator from each of the high schools completed a questionnaire; thus no schools had to be removed from the study sample because of administrator non-response. Therefore, after the removal of high schools that did not administer the in-school survey or

housed elementary or junior high students, the current study sample is comprised of *55 high schools* with students in grades 8 through 12.

Table 3.1 displays descriptive statistics for select characteristics of high schools in the full and study samples in order to examine potential differences between the two samples. Here again, among the full sample (N = 80), a school was defined as a "high school" if it had an eleventh grade, but some of these schools also housed elementary or junior high grades as well. In examining Table 3.1, we see that, relative to the full sample, the current study sample (N = 55) is comprised of larger high schools and proportionately represents more public, suburban, and Southern schools. Also, high schools in the study sample were, on average, attended by a greater percentage of Black students. Thus, the selection filters used to remove schools from the study sample clearly affected the composition of the sample; in particular, removing high schools which also housed elementary or junior high students disproportionately removed rural schools from the study sample. The selection filters used to identify the study sample, therefore, affect the broader implications of the research findings, but it is argued that the schools removed from the sample represent qualitatively different "high schools" (e.g., more culturally and compositionally homogenous) than those retained in the study sample. Accordingly, study results are derived from a sample that is more consistent with the general perception of public high schools in urban and suburban areas (e.g., large, impersonal institutions).

Eligible Students

Selection filters were also used to remove specific students across the 55 high schools in the study sample. First, students were only retained in the study sample if they had a valid sample weight which adjusted for differential selection and non-response. Also, there was, on

average, a six month delay from the time of in-school survey to when the in-home interview was administered. During this time, some students changed schools or reported no longer attending school due to a variety of reasons. Very few adolescents who completed the wave 1 in-home interview, however, reported no longer attending a sample school because of disciplinary reasons (e.g., suspension or expulsion). Students who no longer attended a sample school at the time of the in-home interview were removed from the study sample. Keeping these students in study sample is problematic because school-level variables (e.g., social disorder) created from the in-school survey would then be predicting adolescent weapon carrying at an entirely different school or no school at all in the case of dropouts. And finally, a small number of students were removed from the study sample because their home address information was not successfully geo-coded in a manner that made tract-level census data available.

Overall, there were 11,809 adolescents who completed the wave 1 in-home interview across the 55 high schools in the study sample. After removing students based on the noted selection filters, however, there were 10,308 adolescents retained in the study sample; thus approximately 1,500 students were removed from the sample. Following a similar approach to identifying compositional differences between high schools in the full and study samples, Table 3.2 compares the distribution of select variables for students in the full and study samples across the 55 high schools. And unlike the effects of selection filters used to remove high schools from the study sample, the selection criteria used to retain students appear to have had marginal effects on the composition of the sample. More specifically, the student selection criteria had little impact on the gender and racial composition of the sample, and similar conclusions hold true for the prevalence of drug dealing and school-weapon carrying

in the two samples. In the case of household composition, however, the study sample is comprised of a slightly greater percentage of adolescents who reported residing in a two-parent household at the time of the in-home interview. In general, descriptive information examined in Table 3.2 indicates that removing select students from the study sample only had a modest influence on the distribution of key variables.

VARIABLES

Variables examined in this research are measured at two levels of analysis: *student* and *school*. Each of the student-level variables (including the outcome variable) was constructed from responses provided by adolescents during the wave 1 in-home interview. The school-level measures, on the other hand, were constructed from five distinct data sources, which include: (1) school information (e.g., size) made available by the Carolina Population Center; (2) student responses from the 1994-1995 in-school survey; (3) responses from the 1994-1995 school administrator questionnaire; (4) 1990 census data; and (5) violent crime data from the 1993 Uniform Crime Reports.

Tables 3.3 and 3.4 display descriptive statistics (mean and range) for the student and school-level variables examined in this research; the number of survey items used to construct the variable; each explanatory measures hypothesized directional effect (+/-) on school weapon carrying; and a brief description of the variable. For variables in which no relationship is proposed in Table 3.3 (e.g., age), this indicates that there was no compelling empirical or theoretical reason to hypothesize a directional relationship between the independent variable and the outcome variable. Furthermore, Appendix A lists the exact survey items used to construct summated scales in this research (e.g., parental attachment index), as well as the corresponding reliability estimate for each scale (Chronbach's Alpha,

a). Although a description of each variable is provided in Tables 3.3 and 3.4, this chapter proceeds with a more detailed discussion of how the research variables were constructed.

Dependent Variable

The dependent variable examined in this research is a survey item that was posed to adolescents during the wave 1 in-home interview. Specifically, the question asked was, "During the past 30 days, on how many days did you carry a weapon—such as a gun, knife, or club—to school?" Five response categories were provided that ranged from zero days (coded zero) to 6 or more days (coded four). As might be anticipated, the response distribution for this question was extremely skewed in that more than 90 percent of the adolescents reported never carrying a weapon to school in the 30 days prior to the interview. In order to overcome this heavily skewed distribution, this survey item was recoded as a dichotomous variable wherein adolescents who reported carrying a weapon to school one or more times in the prior 30 days were coded one and reported non-carriers were coded zero.[8]

Following this transformation, roughly 6 percent of adolescents in the study sample reported carrying a weapon to school. This percentage is notably smaller than the proportion of high school students who reported carrying a weapon on school property in the 1995 Youth Risk Behavior Survey (YRBS). More specifically, among a nationally representative sample of students in grades 9 through 12, approximately 10 percent of students reported carrying a weapon "on school property" on one or more of the 30 days preceding the survey (DeVoe et al., 2004). Thus, the wording of the weapon-carrying question on the YRBS is very similar to the one posed during the Add Heath in-home interview.

[8] Because of the limited prevalence of weapon-carrying in school-based samples, this binary coding scheme is consistent with other research examining this outcome (e.g., Wilcox and Clayton, 2001; Williams et al., 2002).

Compared to the YRBS sample, one probable reason for less prevalence in reported weapon carrying among students in the Add Health study is because of differential response. As mentioned, active consent procedures implemented for the in-home interview likely affected the composition of the study sample by under-representing at-risk youth. Of course, similar arguments are applicable to school-based samples in the case of the YRBS (i.e., most at-risk adolescents are not in school). There likely is a more practical reason, however, for finding a reduced prevalence in reported weapon carrying among adolescents in the study sample. The in-home interviews were administered from April through December of 1995; thus some interviews were conducted in the summer. In fact, nearly two-thirds of the in-home interviews were undertaken in June, July, and August. In theory then, an adolescent who completed the in-home interview in August may have answered "no" to carrying a weapon to school for no other reason than not being in school at any point in the 30 days prior to the interview. But after examining the prevalence of school-weapon carrying based on when the interview was completed, it appears as though time has no effect on the incidence of weapon carrying in the sample. For instance, 6 percent of adolescents who completed the in-home interview in June, July, or August reported carrying a weapon to school at least once in the 30 days preceding the interview, which is the very same percentage of students who reported carrying a weapon to school when completing the interview during non-summer months. Furthermore, a dummy variable was introduced in all regression models that controlled for summer interviews, and, throughout these analyses, this variable remained insignificant in predicting school-weapon carrying.

Given the absence of a temporal effect, some adjustment was made on the part of adolescents who were on summer break to consider the reference period the last 30 days of

the school year, or they ignored the reference period altogether.[9] Such a boundless question was also posed during the in-home interview in which adolescents were asked whether they "*ever* carried a weapon at school" (emphasis added). Nearly 10 percent of the study sample answered yes to this question, as opposed to the 6 percent who reported carrying a weapon to school in the prior 30 days. Not surprisingly, the level of association between these survey items is highly significant (.53, $p < .001$), which simply suggests that adolescents who reported ever carrying a weapon at school were likely to report carrying more recently as well. To further address possible measurement error introduced by conducting interviews in the summer when adolescents were likely on break, all statistical models were replicated using lifetime school-weapon carrying as the dependent variable, which is not sensitive to when the in-home interviews were completed. The results produced from these additional analyses are nearly identical to findings derived from the bounded (30 day) weapon-carrying outcome; thus conclusions remain substantively unchanged. These supplemental analyses provide additional assurance that systematic bias was not introduced by completing some interviews in summer months. Given these findings, results presented throughout this research were estimated using *school-weapon carrying in the prior 30 days* as the outcome.

Student-Level Variables

Sociodemographic Characteristics

A number of student-level independent variables are examined in this research, with most of these variables consistent with measures found in the existing literature. The first set of explanatory variables discussed includes measures of student sociodemographic

[9] In e-mail correspondence with Joyce Tabor (September 28, 2005), she disclosed that there is no official documentation that a change was made to the interview itself to account for those situations in which a student was on summer break at the time of the interview. In fact, the school-weapon carrying question was administered using an Audio-CASI (Computer Assisted Self-Interview) program; thus this question was clearly standardized across respondents.

characteristics. These variables consist of gender, age, race/ethnicity, and level of parent education, and, with the exception of age and parent education, the remaining sociodemographic variables are measured as dummy variables. *Gender* is coded one for males and zero for females. The *age* of an adolescent is measured as a continuous variable, with ages ranging from 13 to 21. *Race/ethnicity* is captured with four dummy variables that differentiate non-Hispanic Whites (reference category), non-Hispanic Blacks, non-Hispanic others, and Hispanics. Consistent with prior research (e.g., Kodjo et al., 2003; Simon et al., 1999), *parent education* is used as a proxy of an adolescent's socioeconomic status. This variable is measured on a four-point scale and ranges from less than a high school education (scored one) to college or university graduate (scored four). In cases where both a "resident" mother and father (biological or non-biological) were living in the home, the higher of the two educational attainment scores was used as the assigned value. With the exception of gender and, to a lesser extent, student SES, the remaining sociodemographic variables examined in this research have demonstrated mixed effects in the literature. Consequently, there is no hypothesized relationship for age and race with weapon carrying in Table 3.3.

Family Structure and Relationships

Two variables were created that provide indicators of household structure and quality of parent-adolescent relationships. Household structure is measured wherein adolescents residing in a *single-parent household* are scored one, while adolescents living in a two-parent household are scored zero. Along with household composition capturing possible economic dynamics, it also serves as a proxy for direct supervision. That is, adolescents in two-parent households are presumably more subject to direct supervision than adolescents in single-

parent households and thus fewer opportunities exist to carry out delinquent activities (e.g., weapon carrying).

The quality of an adolescent's relationship with his or her parents is measured with five survey items that were summed to form a *parental attachment* index (a = .86). This summated scale ranges from 5 to 25, with higher scores indicating greater parental attachment. Separate scales were initially created to capture an adolescent's attachment to his or her mother (or mother figure) and father (or father figure). And similar to the approach taken with parental education, the larger of the two attachment scores was the assigned value for parental attachment. Based on Hirschi's (1969) social control theory, it is hypothesized that adolescents reporting a greater attachment to parents are less prone to carry a weapon to school for strong parental bonds serve to inhibit deviant behavior, although there has not been consistent empirical support for this assertion (e.g., Williams et al., 2002). As discussed, there has been stronger empirical support for a relationship between household composition and student weapon carrying (e.g., Bailey et al., 1997; Forrest et al., 2000).

Academic Performance and School Attachment

Because the outcome of interest deals with school-based delinquency, it is imperative to account for educational experiences of students that potentially influence in-school misbehavior. In general, extant research has relied on measures of academic performance and school attachment to capture how educational experiences affect student weapon carrying (e.g., Hemenway et al., 1996; Kingery et al., 1998). This research employs similar school-based measures in that one variable serves as an indicator of educational performance, while three others function as measures of school attachment. Students were asked what grades they received for English, math, science, and social studies during their last evaluation period

in school, with responses ranging from one (A) to four (D or lower). These four items were reverse coded and then averaged to provide a measure of a student's *grade point average* (GPA), which serves as the indicator of school performance. Higher scores on the averaged GPA index signify better performance in the classroom.

Adolescents were also asked during the in-home interview whether they "ever received an out-of-school suspension," as well as the number of times they skipped a "full day" of school without an excuse during the most recent school year. Both these survey items are used as indicators of school attachment or commitment, where *school suspension* is coded one if a student reported ever being suspended and coded zero otherwise; while *unexcused absence* is scored one if a student skipped one or more days without an excuse during the most recent school year and scored zero if a student had perfect attendance or excused absences.

A summated scale was also constructed to capture the strength of an adolescent's social connection to school. The *school attachment* scale was constructed from six survey items, with scores ranging from 6 to 30 and higher scores indicating greater school attachment. Here again, existing findings have not provided consistent support for the assertion that school performance (e.g., GPA) is a strong determinant of in-school misbehavior (e.g., Kulig et al., 1998; Simon et al., 1998), while research has shown greater support for direct measures of school attachment in predicting school-based delinquency (e.g., Kingery et al., 1999). Thus, it is anticipated that, compared to student GPA, the three measures of school attachment examined here will serve as stronger determinants of school-based weapon carrying.

Fear and Victimization

Measures of self-perceived fear and victimization experiences are common in studies that explore weapon possession at school (e.g., Bailey et al., 1997), and this research is no exception. Two measures of student fear are examined in this study: *school fear* and *neighborhood fear*. School fear is a single-item variable that ranges from one to five, with one indicating that students "feel safe" in school and five signifying adolescents do not feel safe in school. Furthermore, in recognition that students may carry weapons to school as a result of apprehension associated with returning to one's neighborhood after school, a binary variable of neighborhood fear was constructed wherein adolescents who reported that they "usually feel safe" in their neighborhood were coded zero, while adolescents who reported not feeling safe in their neighborhood were coded one.

As Garofalo (1979) and others have pointed out, the two fear variables examined here represent "global" or "formless" measures of fear of crime, for there is no reference to specific acts of crime or victimization (e.g., physical assault). In general, global survey items serve as rather weak indicators of fear of crime compared to variables that measure behavior modification (or spatial shifting) that results from fear of victimization (Warr, 2000). Although a variable is examined in this research that addresses whether a student missed any days of school that was not excused, it is uncertain whether these absences were a consequence of fear related to attending school. Accordingly, prior research suggests that, despite their theoretical relevance, these constructed measures of school and neighborhood fear should have little to no effect on weapon carrying after controlling for other relevant variables.

A direct measure of *weapon victimization* was also created to accompany the two cognitive measures of formless fear. This measure is a dummy variable that was originally constructed from four survey items which asked adolescents whether in the last year they saw someone shoot or stab another person, had someone pull a gun or knife them, had been shot, or had someone cut or stab them. Because the incidence of these events was so infrequent in the sample, these items were collapsed to form a single victimization measure coded one if an adolescent reported experiencing any one of these events in the prior year and coded zero if they encountered none of these incidents. Within the context of the fear of victimization argument, it is hypothesized that adolescents who experience or witness serious forms of violence will in turn be more likely to carry a weapon for purposes of self-protection. Notably, none of the survey items used to construct the weapon victimization measure was written in such a way that made their occurrence specific to school. As touched upon, however, students victimized outside of school may still feel compelled to carry a weapon to school in preparation for confrontational incidents that unfold before or after school.

Problem Behaviors

It is consistently revealed in the existing literature that involvement in problem behaviors are significant determinants of weapon carrying (Brown, 2004). Given this consistent finding, three variables were constructed that account for involvement in problem behaviors beyond weapon carrying. The first, *property crime*, was created much like the measure of weapon victimization in that multiple survey items were collapsed to form a single variable. More precisely, three items were used to construct a binary measure of property crime involvement, and these items include whether an adolescent reported stealing a car, something worth more than $50, or something from a building or house in the prior year.

Adolescents who disclosed involvement in any one of these three behaviors were scored one, while non-participants were scored zero.

The second problem behavior variable, *interpersonal violence*, measures an adolescent's involvement in physical confrontations both in and outside of school. Students were asked how often they got into a serious physical fight, hurt someone bad enough that they needed medical care, and fought with a group of their friends against another group. Response categories for each item ranged from zero (never) to three (five or more times), with only a small percentage of adolescents reporting multiple occurrences of any one of these events within a 12-month period. Consequently, these survey items were treated as binary variables (e.g., did or did not participate) and then summed to form an index of interpersonal violence (a = .75). Scores on the index range from zero to three, with a score of three indicating that an adolescent was involved in all three types of physical violence in the prior year.

The third and final measure of problem behavior examined in this research, *sold drugs*, includes involvement in drug dealing. Two behaviors in the literature have become closely linked to weapon-related activities, and they include drug dealing and gang involvement (Black and Ricardo, 1994; Sheley and Wright, 1995). Unfortunately, adolescents were not questioned about gang involvement during the wave 1 in-home interview, but they were asked how often they sold "marijuana or other drugs" in the prior year. Adolescents who reported selling one or more times in the last year were coded one and non-sellers were coded zero. Based on prior research findings, it is expected that the measures of problem behaviors examined in this research will be particularly strong predictors of school-based weapon carrying.

Control Variables

Along with one's own involvement in problem behaviors, adolescents who associate with peers who also take part in delinquent activities are more likely to report carrying weapons to school (Wilcox Rountree, 2000; Wilcox and Clayton, 2001). Unfortunately, there was no direct measure of peer delinquency posed during the in-home interview and thus a three-item proxy was used. Adolescents were asked how many of their three best friends used cigarettes, alcohol, or marijuana. These items were summed to construct the *peer drug use* index in which scores range from zero to nine (a = .76). Bellair, Roscigno, and McNulty (2003: 19) argued that peer drug use likely serves as "…a reasonable proxy because drug use is strongly correlated with other forms of delinquent behavior…" Of course, based on the arguments of social learning theory, it is anticipated that adolescents who associate with substance users (a proxy for delinquency involvement) will be more likely to report carrying a weapon to school.

Some recent high profile school shootings, such as those in Littleton, Colorado and Red Lake, Minnesota, have raised concerns that students who are not socially or emotionally well-adjusted are at greater risk of carrying weapons to school. In an effort to address this issue in part, a nine-item *depression* index was created that captures the recent emotional well-being of adolescents (a = .84). This variable was constructed by summing across the nine items that make-up the index, which were originally measured on a four-point scale (0 = never to 3 = most of the time). Scores range from zero to twenty-seven, with higher scores indicating greater feelings of depression or emotional maladjustment.

The final student-level variable, *household handgun*, examined in this research deals with the availability of a handgun in the home. During the in-home interview, adolescents

were asked whether a gun was "easily available" in their home and, if so, whether a handgun was available. Relative to long guns, handguns are more likely to be retained and carried for purposes of self-protection (Lizotte et al., 1994), which presumably is the main reason why students carrying weapons to school. It is argued here that adolescents who have ready access to a handgun in the home are more likely to carry a weapon to school because of a constant opportunity to acquire a weapon (a handgun) with minimal effort, and, in theory, they are socialized in an environment that values the use of weapons for purposes of self-protection.

School-Level Variables

Ecological Environment and Milieu

A number of school-level measures are examined in this research, and these variables can be generally divided into three broad categories: (1) *ecological environment* and *milieu*; (2) *social system* and *culture*; and (3) *imported community conditions*. The first category of variables represent what Anderson (1982) identified as measures of the school *ecological environment* or *milieu*. For purposes here, these ecological or milieu measures are viewed as objective indicators of the school context that are considered beyond the immediate control of schools. In general, measures of a school's ecological environment generally pertain to physical features of a school that are external to participants (e.g., size; Anderson, 1982). The first ecological measure, *urban school,* is scored one if a school is located within the central city of a metropolitan area and scored zero if a school is situated outside a central city (i.e., suburban or rural schools). *Private school* is coded one if a school is a parochial or non-parochial private school and coded zero if a school is a public school.

There arguably has been no variable that has received as much attention in the school effects literature as school size (Gottfredson, 2001). In this research, not all the high schools

in the sample are comprised of the same number of grades (e.g., four grade levels), which means that some schools may have more students in the sample as a result of housing more grades. In order to simplify comparison between schools in the sample, *schools size* was standardized in this research by way of dividing the total number of students in a school by the total number of grades; thus school size represents the average number of students per grade in a school. The final ecological measure examined in this research pertains to the regional location of a school. *Southern school* is coded one if a school is located in the South and coded zero if a school is positioned outside the South.

With the exception of Southern school, the school ecological variables examined in this research address common characteristics generally associated with weapon violence in schools. That is, if someone from the general public were asked to identify school characteristics they most commonly associate with in-school violence, characteristics such as minority makeup, urban location, public school status, and size would likely be mentioned for school violence normally is not considered a problem in small rural schools primarily attended by white students (see e.g., Menifield, Rose, and Homa, 2001). Furthermore, within the structure of the schools-as-communities perspective, large urban schools theoretically face more difficult challenges exercising control over their students due to greater anonymity and mobility (i.e., wavering attendance) among their student bodies; thus making it more problematic to regulate student misbehavior. In the case of private schools, Bryk et al. (1993) found that, relative to public schools, Catholic schools are more successful in fostering a "communal" environment for students to learn and interact. Empirically, however, some of these arguments have not received great support in the extant research. For instance, school size has demonstrated inconsistent effects on a variety of school-based outcomes (Anderson,

1982; Gottfredson, 2001). Despite this lack of empirical support in some cases, it is hypothesized that racial composition, urbanicity, sector, and size are related to school-weapon carrying.

The importance of region in explaining rates or incidents of interpersonal violence has received considerable attention in the existing research. These extant studies have originated, in part, from the finding that rates of homicide in the South are generally higher than in other regions of the United States (see e.g., Gastil, 1971; Huff-Corzine, Huff, and Moore, 1986; Loftin and Hill, 1974; Messner, 1982). Studies that explore these regional differences often proclaim to test the southern subculture of violence thesis, which, among other things, raises arguments that being brought up or socialized in the South predisposes individuals to excuse defensive or retaliatory forms of violence (Ellison, 1991; Gastil, 1971; Hackney, 1969), as well as increases the presumed likelihood of acquiring a firearm in adulthood (Dixon and Lizotte, 1987; O'Connor and Lizotte, 1978). Given this coexistence of predispositions to condone violence and possess firearms or weapons, it is argued that schools located in the South will exhibit a greater prevalence of weapon carrying among their students. Some of the research noted above, however, found that a "Southern effect" was mediated after controlling for other structural or etiological determinants of violence.

Anderson (1982) also noted the commonality of measures of the *milieu* in the school climate literature, which include variables that capture characteristics of students within schools. One such school-level measure is examined in this research. *Percentage Black* serves as an indicator of the racial composition of schools. This variable is measured on a four-point scale wherein the categories represent quartiles; thus a score of one indicates a school fell toward the bottom one-fourth of the distribution, while a score of four signifies a

school was at the top one-fourth of the distribution (i.e., greater proportion of students who are Black).[10]

Social System and Culture

The second broad category of school-level variables examined in this research represents measures or indicators of the school *social system* or *culture*. Contrary to the ecological and milieu variables, it is argued that indicators of the school social system or culture are—to varying degrees—more amenable to the immediate control or manipulation of schools (Gottfredson, 2001). Anderson (1982) noted that measures of a school's social system or culture capture such conditions as the quality of interaction among students and teachers, as well as measure student norms and belief systems.

The first of these variables captures the level of participation in the *parent-teacher association* (PTA), which was constructed from the school administrator survey. School administrators were initially asked whether their school had a PTA, and, if so, what percentage of students had family members who participated in the organization. Due to a heavy right skew in the distribution of this variable, a constant of one was added to this measure (some schools reported no PTA or participation) and then logged to induce normality. Administrators were also asked the "approximate average daily attendance level" in their respective school, with response categories ranging from one (95 percent or more) to five (75 to 79 percent). The vast majority of administrators reported student attendance levels exceeding 90 percent in their school. Given this heavily skewed distribution, the level of *student absenteeism* is coded 1 if the average daily attendance of a school was less than 90

[10] The *percentage Black* variable was created in conjunction with the in-school survey and no continuous variable of racial composition was provided.

percent—which served as a natural break in the distribution—and coded zero if it was above 90 percent.

The second measure of the school environment or culture deals with the level of extracurricular involvement among students in a school. During the in-school survey, students were asked to indicate if they were *not* involved in any extramural activities at school. This measure, *extracurricular inactivity*, was aggregated to the school-level and thus represents the proportion of students who reported not participating in any extracurricular activities. An additional school-level variable examined in this research is a measure of the level of *social disorder* within a school. For this measure, four of the six items comprising the school attachment index at the individual-level were simply aggregated, summed, and then recoded to have higher scores reflect greater disorder at the school level (a = .91).

The last two measures of the school social system or culture capture the level of student fear and violent disposition of adolescents in schools. F*earful students* represents the proportion of adolescents who agreed or strongly agreed that they did not feel safe in their school. And finally, *physically fought* captures the proportion of students who reported being in a physical fight either in or outside of school in the year prior to the in-school survey.

The school-level measures of PTA participation and social disorder could also serve as measures consistent with the schools-as-communities perspective (see e.g., Furman, 2002; Payne et al., 2003). That is, schools in which levels of PTA participation and social cohesion are high are better equipped to exercise control over their student bodies and, in the process, offset the incidence of weapon carrying among students. With respect to the measures of fearful and physically violent students, these variables provide a school-level test of arguments surrounding the association between student fear, victimization, and weapon

possession. In theory, students are likely to perceive a greater need for a weapon when attending schools comprised of students who express uncertainty about their safety and partake in physical violence. Thus, it is expected that schools where students express trepidation concerning their safety and report involvement in interpersonal violence will have greater pervasiveness in weapon carrying among their respective students.

"Imported" Community Conditions

The final category of school-level variables examined in this research includes three measures of the external community conditions of schools. As noted, Welsh and colleagues (1999) made an important distinction between the "local" school community and the "imported" school community. The local school community represents the immediate area surrounding a school, while the imported school community corresponds to the attendance or catchment area. Unfortunately, the Add Health study does not disclose the specific location (i.e., census tract or county) of where schools in the study are situated; hence, the measures of school community examined in this research correspond to the "imported" school community (i.e., attendance area).

Two data sources are used in this research to construct measures of the imported school community: 1990 census data and 1993 UCR data. With respect to the census data, these data were measured at the tract-level and correspond to the census tract in which an adolescent resided. These tract-level data were used to construct school-level measures of *imported disadvantage* and *imported mobility.* Following a similar procedure employed by Welsh and colleagues (1999), the items comprising the measures of imported disadvantage and imported mobility were initially multiplied by the total number of students residing in a particular tract, and then these products were summed across all tracts within a school to

provide a single summary variable. The final step in the process was to divide this summated or aggregated item by the total number of students who participated in the study from a school. As Welsh et al. (1999: 90) indicated, the resulting value represents a "weighted average" of characteristics of neighborhoods (e.g., poverty) from which schools received students. With the current sample, the 55 high schools received students, on average, from 25 different census tracts (median is 15 tracts). Thus, the school-level measures of imported disadvantage and imported mobility characterize community conditions across all census tracts served by a given school.

The items making up the measures of imported disadvantage and imported mobility are consistent with similar variables found in the extant research that examines the relationship between neighborhood characteristics and violence (see e.g., Sampson, Raudenbush, and Earls, 1997). Six items were used to construct a summated scale for imported disadvantage (a = .78), while three items were employed to create a summated index for imported mobility (a = .61) (see Appendix A). More specifically, items comprising imported disadvantage and imported mobility were multiplied by a principal components factor loading and then summed across items within the scale. Higher scores on each index represent greater disadvantage and mobility within a school attendance area. Because of outliers and resulting skew, a natural log transformation for imported disadvantage and mobility was performed.

The final school-level variable examined in this research is *imported violent crime.* This variable was constructed using UCR county-level data pertaining to violent crime rates in 1993. Although these data are measured at the county-level, the identical process was applied in constructing imported violent crime as was taken with the tract-level data. As

might be anticipated, however, the overwhelming majority of students from any given school were received from just one county; thus, fewer units per school were involved in creating a single summary measure to characterize the violent crime rate within school attendance areas. Higher values for the measure of imported violent crime correspond to higher rates of violent crime in a school community. This imported variable was also logarithmically transformed to reduce the level of skew in the distribution.

Overall, even though the school-level variables discussed here originated from data collected at conceptually different levels (students, administrators, tracts, and counties), each of the school-level variables in this research, at least empirically, are considered of similar quality in capturing "school-level" processes or dynamics. In addition, each of the imported contextual variables is expected to have a significant effect on student-weapon carrying across high schools in the sample. That is, based on arguments derived from the spillover hypothesis, schools serving communities with greater imported disadvantage, mobility, and violent crime are expected to have more students who report carrying a weapon to school.

ANALYTIC STRATEGY

Multilevel Models

Multilevel modeling was used to address questions raised in this research. More specifically, Raudenbush and colleagues' (2004) hierarchical modeling software, *HLM 6*, was employed to estimate multilevel models. Multilevel modeling has become the accepted practice for estimating the effects of school or community characteristics on individual behavior, for these models are able to account for the non-independence or clustering of observations within larger contextual units (Hox, 1995; Raudenbush and Byrk, 2002). A notable benefit of multilevel modeling is the ability to decompose or partition variance in the

outcome into within and between-group components. For purposes here, this means that it can be determined whether the likelihood of students carrying a weapon to school significantly varies across high schools in the sample.

The multilevel models estimated in this research consist of two levels. The level-1 or within-schools model uses the individual-level explanatory variables to predict the likelihood of a student carrying a weapon to school. The treatment of the outcome as a dichotomous variable (yes or no) signifies that nonlinear regression models should be estimated given the binary structure of the dependent variable (Guo and Zhao, 2000). Using notation employed by Raudenbush and colleagues (2004), equation one (eq. 1) represents the generic level-1 model used to predict the natural log of the odds that student i in school j will report carrying a weapon to school. In this equation, η is the natural log of the odds of success (weapon carrying), and ϕ is the probability of success. β_{Qj} represents the effect of variable Q on the dependent variable for each school j, while X_{Qij} is the value of the level-1 predictor Q for student i in school j.

$$\eta_{ij} = \log\left[\frac{\phi_{ij}}{1-\phi_{ij}}\right] = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \cdots + \beta_{Qj}X_{Qij} \qquad \text{(eq. 1)}$$

The level-2 or between-schools model is represented in equation 2 (eq. 2). With this model, the school-level independent variables are used to explain variability in the level-1 intercepts. In equation 2, β_{0j} is the mean likelihood of weapon carrying for school j, and γ_{0m} is the effect of variable m on the level-1 intercept for school j. W_{mj} is the value of the level-2 predictor m for school j, while u_{0j} is the unique effect (random component) of school j on the level-1 intercept.

$$b_{0j} = g_{00} + g_{01}W_{1j} + g_{02}W_{2j} + \cdots + g_{0m}W_{mj} + u_{0j} \quad \text{(eq. 2)}$$

The equations outlined represent a random-intercept model in which the slope coefficients (e.g., b_1) are treated as "fixed." Estimating a fixed-effects multilevel model assumes the effects of the explanatory variables (e.g., SES) on weapon carrying are identical across each high school in the sample (see Raudenbush and Bryk, 2002). This assumption can be relaxed by estimating a random-slope model in which the effects of the independent variables are allowed to randomly vary across high schools in the sample. Random-slope models are generally estimated when there are strong theoretical reasons to do so, or one objective of the research is estimating a model which best fits the data. There is little theoretical reason to treat independent variables in this research as random, and it is not an objective of this research to identify a model that best fits the Add Health data. Accordingly, given that the primary objective here is whether variation in mean weapon carrying is explained by community conditions after adjusting for student-level characteristics, the analyses are limited to random intercept, fixed-effects models.

Centering

As indicated by Hofmann and Gavin (1998), one of the primary issues confronting researchers who utilize multilevel modeling is how to go about scaling the level-1 independent variables. In general, one of three approaches can be applied by a researcher: keep the variables in their current or raw metric, grand-mean center, or group-mean center the level-1 variables. Relative to leaving the level-1 variables in their original metric, it is usually beneficial to center the level-1 variables in multilevel models because the estimated parameters for the level-1 variables serve as outcome variables in the level-2 model; therefore having a meaningful interpretation of the level-1 variables is useful (Hofmann and Gavin,

1998). For example, in this research, a primary focus is whether the imported community variables have an effect on weapon carrying after adjusting for school differences in student-level characteristics (e.g., race). In estimating such a model (i.e., random-intercept model), if each of the student-level independent variables were left in their original metric, the imported community variables (e.g., violent crime) would be used to explain variability in the school intercepts (b_{0j}) when all the student-level variables are assumed to be equal to zero. Of course, for a number of student-level variables examined in this research, such as age, a value of zero is not possible or particularly meaningful; thus rescaling or centering the level-1 independent variables is generally undertaken to make the intercept more meaningful (Luke, 2004; Paccagnella, 2006).

Accordingly, the greater issue of debate in multilevel modeling is not deciding whether to center level-1 variables, but how one should go about centering level-1 variables (see e.g., Raudenbush, 1989; Kreft, de Leeuw, and Aiken, 1995). In their examination of the issue, Kreft et al. (1995) concluded that centering around the group mean amounts to estimating "a different model" than the case for grand-mean centering or using raw scores. Based on this conclusion in part, Luke (2004: 52) cautioned that group-mean centering is more complicated than grand-mean centering, and, as a consequence, "…one should use group-mean centering only if there are strong theoretical reasons to do so." Given the objectives of this research, there are no compelling theoretical reasons to group-mean center the level-1 variables. In fact, Hofmann and Gavin (1998) recommended the use of grand-mean centering when the intended interest of a study is to examine what effect contextual variables have on an individual outcome "above and beyond" the individual-level predictors, which is the focus of this research. Therefore, when estimating multilevel models that include

student-level predictors, the level-1 variables are grand-mean centered, and the level-2 variables, unless otherwise indicated, are modeled using raw scores.[11] As Raudenbush and Bryk (2002: 35) noted, "In general, the choice of the location for the *W*s [level-2 variables] is not as critical as for the level-1 predictors."

Sample Weights

Comparable to other survey data collected using complex sampling designs (e.g., NCVS), student-level sample weights were calculated for each participant of the wave 1 in-home interview. These weights adjust for unequal selection probabilities and compensate for differential response rates across various subgroups in the Add Health sample. In addition, school-level sample weights were also estimated for each school in the Add Health sample to similarly account for differential selection and non-participation among schools (see Tourangeau and Shin, 1999).

It is well understood that sampling weights should be used in estimating population means, totals, or proportions, but the application of sampling weights in regression analyses has been the subject of some debate (see e.g., DuMouchel and Duncan, 1983; Lohr and Liu, 1994; Winship and Radbill, 1994). Winship and Radbill (1994) recommended the use of sample weights in regression analyses in circumstances where the weights adjust for specific sample features (i.e., design weights), such as in the case of cluster sampling when selection is proportional to size; a procedure used to select high schools in the Add Health study. Lohr (1999: 365) recommended estimating regression models with and without sample weights, and, if results differ, "…then you should explore alternatives to the model you have adopted." This with and without samples weights approach was undertaken in this research but

[11] Supplemental analyses revealed, however, that the centering strategy (grand vs. group mean centering) did not substantively alter the interpretation (in terms of strength and direction) of the level-1 variables.

discussed findings are based on *weighted* data; at no point, however, are substantive conclusions altered when estimating models using unweighted data.

Recent versions of multilevel software permit the application of sample weights at multiple levels in estimating linear and nonlinear models. But as Chantala, Blanchette, and Suchindran (2006) documented, however, regression parameters estimated using weighted data in multilevel models vary across software packages because of differences in how these packages "scale" sample weights. The most recent release of HLM (version 6) scales sample weights using a computational procedure devised by Pfefferman and colleagues (1998). With this procedure, level-2 (school) weights are adjusted to have a mean of one and, when summed, equal to the number of level-2 units in the sample; while level-1 (student) weights are adjusted to have a mean of one *within* level-2 units (Raudenbush et al., 2004). In other words, the design or sample weights are normalized.

Missing Data

Missing data among the level-2 variables was not an issue in this research. With respect to the student-level variables, each was created with responses from the wave 1 in-home interview. This interview was comprised of 40 sections wherein questions were raised concerning a variety of adolescent issues (e.g., romantic relationships and emotional well-being). Notably, 11 out of the 40 sections were administered using audio computer assisted self-interviewing (audio-CASI). Most of the audio-CASI sections contained questions regarding "sensitive" information, such as disclosing one's involvement in delinquent and sexual activities. The proposed benefit to using audio-CASI is that potential biases introduced by "interviewer effects" are reduced or removed altogether. One potential bias, for example, deals with the social desirability bias in that adolescents may be more inclined to

disclose behaviors that they perceive as "desirable" (e.g., getting along with parents) in hope of pleasing the interviewer.

The level of non-response across items in the in-home interview was minimal in sections both using and not using audio-CASI. In fact, for the interview items used to construct student-level variables in this research, item non-response seldom exceeded *two percent* for any given question. Because of the number of explanatory variables examined in this research, however, the use of listwise deletion to handle missing data results in the removal of nearly 950 cases (or nine percent of the sample).

In an effort to retain these cases, a multiple imputation procedure was utilized using the stand-alone, freeware program *Amelia* to impute missing values (see Honaker, Joseph, King, Scheve, and Singh, 2001; King, Honaker, Joseph, and Scheve, 2001). As King and colleagues (2001: 53) explained, "Multiple imputation involves imputing *m* values for each missing item and creating *m* completed data sets." That is, observed values are used to predict missing values, and, in the process, *m* (generally five) new data sets are generated in which the observed values remain unchanged but the imputed values differ across the *m* data sets. Once generated, one proceeds by fitting the same regression model for each new data set and then regression coefficients and standard errors are averaged across the *m* models to produce a single estimate (King et al., 2001). Contrary to more traditional imputation procedures (e.g., mean substitution), multiple imputation attempts to model "uncertainty" associated with filling in missing data. And regression coefficients generated with data in which missing values are filled in using multiple imputation generally have larger standard errors than the case with traditional imputation procedures. Findings discussed in this

research are based on imputed data, but conclusions remain unchanged when statistical models are estimated using listwise deletion.

SUMMARY

Once again, the primary focus of this research is to examine the effects of broader community conditions on school-based weapon carrying. This research addresses this objective with data from the Add Health study. Specifically, the study sample examined in this research is comprised of 10,308 students who were attending 55 high schools throughout the country in 1995. These data are analyzed using a two-level hierarchical model, which is utilized to identify whether there is significant variation in student weapon carrying across the 55 high schools in the study sample, and, if so, whether the imported community conditions of economic disadvantage, residential mobility, and violent crime meaningfully account for any of this between-school variation.

The dependent variable is a binary outcome that distinguishes students who reported carrying a weapon to school in the 30 days prior to the in-home interview. With respect to the explanatory variables, these measures capture student, school, or community attributes. The student-level variables fall into one of five categories: (1) sociodemographic characteristics; (2) family structure and relationships; (3) academic performance and school attachment; (4) fear and victimization; or (5) problem behaviors. The explanatory variables that account for school characteristics, on the other hand, measure aspects of a school's ecological environment or social system, and some also serve to test fundamental assertions of the schools-as-communities perspective (e.g., social disorder). And finally, the imported community variables provide measures of the broader environment in which schools operate, and these measures ultimately serve to assess the merits of the spillover hypothesis.

The next chapter begins by formally stating the hypotheses examined in this research. In particular, time is taken to elaborate on the theoretical contention that community conditions external to schools affect in-school misbehavior (i.e., spillover hypothesis). In addition, the policy implications of the spillover hypothesis are expounded upon, with particular attention paid to the meaningful hypotheses that can be formulated from these implications. Following a discussion of the research hypotheses, descriptive and multilevel results are presented that specifically test the validity of the stated hypotheses.

CHAPTER 4

HYPOTHESES AND WEAPON CARRYING RESULTS

HYPOTHESES

The *primary* research question addressed in this research is whether measures of "imported" community conditions have an effect on weapon carrying above and beyond individual and household (level-1) predictors. Welsh and colleagues (1999) and Benbenishty and Astor (2005) addressed a similar question in their examination of the influence of external community conditions on student violence in Philadelphia and Israeli schools. Hofmann and Gavin (1998: 634) characterized this empirical approach as the "incremental paradigm" in that a researcher, fundamentally, is concerned with, "…the influence of group level variables on individual-level outcomes after controlling for various individual-level predictors." More specifically, drawing from the spillover or importation argument, it is hypothesized in this study that:

> *Students who attend schools in communities that experience greater economic disadvantage, residential mobility, or violent crime will be more likely to disclose carrying a weapon to school, net of other predictors* (H_1).

The importation or spillover hypothesis proposes that community conditions external to schools *directly* influence behaviors inside of schools, but this argument offers no insight as to how this process actually unfolds. Welsh et al. (2000), however, detailed a number of processes by which community conditions external schools may affect in-school violence. One of these processes suggests that schools serving socially disorganized communities, which have been generally identified with indirect measures such as economic disadvantage and residential mobility (see e.g., Gottfredson, McNeal, and Gottfredson, 1991; Parker and

Maggard, 2005; Sampson, 2002; Warner and Pierce, 1993), are less effective in exercising control over students because so little control is exerted in the broader community. As a result, adolescents raised in communities characterized by greater economic disadvantage and residential mobility become acclimated to experiencing little informal control outside of the home and thus grow less receptive to exercised control in public behavioral settings (e.g., schools). Accordingly, students attending schools in socially disorganized communities are presumably less deterred from carrying a weapon to school because of inadequate control in their broader communities, which serves to reduce one's likelihood of being caught with a weapon.

The direct relationship between external community violence and in-school violence may also be premised on arguments of exposure or vulnerability to crime *and* normative acceptance of violence. Relative to adolescents residing in low crime communities, students situated in areas plagued by violence (often in inner-cities) are more likely to encounter criminally predisposed residents in conducting their everyday activities (see e.g., Hurt, Malmud, Brodsky, and Giannetta, 2001; Margolin and Gordis, 2000). This elevated exposure to prospective offenders is likely sustained in educational settings as well, for most schools have little control over the physical composition of their students. In other words, schools located in high crime communities are inevitably attended by students more involved in delinquent and criminal behaviors. Thus, in recognition of this sustained exposure or vulnerability to violence both in and outside of school, students residing in or exposed to high crime areas likely perceive a greater need to carry a weapon in an effort to preserve their own physical well-being (see e.g., Cook and Ludwig, 2004; Patchin et al., 2006).

The aforementioned arguments were formulated from theories that call attention to the relationship between routine activities and criminal offending or victimization (e.g., Felson, 2002) and one's corresponding need for a weapon. Welsh and colleagues (2000) also discussed that in-school violence may be shaped by the importation of norms favorable to the use of violence to resolve disputes. This argument pulls from subcultural theories of crime which underscore that criminal norms can be transmitted among delinquent or economically marginalized groups (e.g., Cohen, 1955). For purposes here, adolescents nested in communities with elevated rates of crime may come to accept (or at least not condemn) the use of violence to settle interpersonal arguments (see Anderson, 1999; Stewart, Simons, and Conger, 2002). Consequently, relative to schools situated in nonviolent communities, schools receiving students from especially crime prone areas are more likely attended by students amenable to the use of violence, such as weapon carrying, in everyday activities.

The most important implication of the spillover hypothesis is that schools have little to no effect on the behaviors of their students. Here again, the importation hypothesis contends that violence in and around schools is explained by conditions in the community and *not* the product of environmental or social dynamics in schools. Within the framework of the spillover argument, Sheley and Wright (1995: 5) articulated that "…schools no longer have distinct roles in the etiology of youth violence; rather they have become the physical locations where larger community problems are manifested" (see also Reiss and Roth, 1993; Sheley et al., 1992). Laub and Lauritsen (1998: 127) further suggested that, among the general public, the spillover hypothesis is the most accepted explanation of violence in schools; that is, "conventional wisdom" holds that school violence is imported from the broader community.

Thus, based once more on the spillover or importation argument, it is hypothesized in this research that:

> *Contextual measures of a school's ecological environment and social system will have no effect on student weapon carrying after controlling for imported community conditions* (H_2).

In essence, this hypothesis contends that any existing relationship between school-level characteristics (e.g., social disorder) and student weapon carrying will be mediated after accounting for imported community variables (e.g., violent crime). Of course, this argument runs contrary to theories of school climate and the schools-as-communities perspective, which clearly offer theoretical justification for Gottfredson's (2001) conclusion that schools influence student behaviors. To this end, most violence prevention programs implemented in schools are not consistent with the spillover hypothesis. For example, in a recent meta-analysis of school-based violence prevention programs, Gottfredson et al. (2002) categorized prevention programs based on their treatment components. Interestingly, none of the specified categories by which programs were grouped dealt with conditions external to schools. In fact, all of the prevention programs were focused on either changing the school environment (e.g., expectations for behavior) or the student (e.g., self-control). Thus, there was no mention of prevention programs oriented towards the conclusion that community conditions alleviate or exacerbate student misbehavior, which, obviously, is not in line with arguments of the importation hypothesis.

Undoubtedly, some would argue that, on top of everything else we ask of schools, it would be unreasonable to call upon schools to manage "school-based" prevention programs that incorporate an active community component, such as integrating external stakeholders

like parents or law enforcement agencies. Gottfredson (2001) has detailed, for example, some of the immense community problems facing many urban schools that inhibit innovation and effective school reforms to reduce violence. As she pointed out, many of these urban problems, such as a declining tax base and loss of jobs paying a livable wage, have been decades in the making and will take decades to fix (see also Wilson, 1996). Most would concede, therefore, that schools cannot be expected to change nor overcome the pervasive structural inadequacies of the communities they serve. There seems to be, however, an increasing call for prevention programs that address adolescent and school violence within a "comprehensive" framework (see e.g., Cunningham et al., 2000; Howell, 1995). This approach was advocated by Pollack and Sundermann (2001:13) in discussing school violence, "We now understand that safe schools require broad-based efforts on the part of the entire community including educators, students, parents, law enforcement agencies, businesses, and faith-based organizations."

The policy implications of the importation hypothesis for the prevention of school violence are quite significant, therefore. On one end of the spectrum, we have scholars who embrace the importation argument that no prevention effort will have a discernible and sustained effect on school violence absent structural and cultural changes in the larger community (e.g., Sheley et al., 1992). On the other end of spectrum, we have scholars who concede that some schools are situated in communities facing especially adverse conditions, but schools, even in these harsh communities, are capable of implementing prevention programs that have a discernable and sustained effect on levels of violence within their halls (e.g., Gottfredson, 2001). And likely somewhere in between are advocates of comprehensive

programs who promote a combination of these perspectives; that is, prevention programs which attempt to manipulate school *and* community conditions.

Notably, each of these perspectives underscores the importance of different contextual variables. As hypothesized, the spillover argument clearly identifies the significance of imported community conditions in accounting for in-school violence; while arguments consistent with the school climate or school effects literature regard school environmental conditions as the more proximate contextual determinants of in-school violence. Finally, proponents of comprehensive prevention programs would contend that contextual indicators of school *and* community conditions each account for measurable effects on school violence.

The focus of this research is to examine the effects of school and, in particular, community contextual variables on student weapon carrying. It would be ill-advised, however, to overlook the importance of student characteristics in explaining weapon carrying. As outlined in the previous chapter, the proposed framework for examining weapon carrying in this research is through multilevel modeling, but, as Wikstrom (1998) and Gottfredson (2001) pointed out, multilevel studies exploring the effects of communities and schools on individual behaviors have generally found that contextual variables explain modest levels of variability in person-based outcomes (see also Gottfredson et al., 1991). As Wikstrom (1998) further remarked, it would be premature to deduce from these modest findings that contextual characteristics are inconsequential in the study of individual behavior. It is fair to conclude, however, that most of the variability in individual offending or victimization generally lies within contextual units.

Much time was taken from the outset of the literature review (Chapter 2) to discuss student characteristics associated with weapon carrying based on theoretical or empirical

grounds. Different measures of particular theories of crime, such as Hirschi's (1969) social control theory, were identified as possible candidates for explaining variability in student weapon carrying, but, as indicated by Brown (2004), *gender* and involvement in *problem behaviors* have been the only student-level variables consistently associated with weapon carrying irrespective of the composition of a sample. Although additional student-level relationships are proposed (see Table 3.3), based on the findings of Brown (2004) it is hypothesized in this research that:

> *Males and adolescents involved in problem behaviors (e.g., property crime) will be more likely to report carrying a weapon to school, net of other predictors* (H_3).

This research proceeds with a brief discussion of descriptive statistics for the student- and school-level variables. In addition, correlation matrices are presented in order to display the level of association among the student and school-level measures. Following a discussion of these basic findings, the chapter proceeds by estimating a fully unconditional (or intercept-only) model in HLM. As Raudenbush and Bryk (2002) pointed out, estimating such a model often serves as a useful first step in multilevel analysis, for the unconditional model captures whether there is significant variation in the outcome (weapon carrying) across contextual units (55 high schools), absent the inclusion of any control or explanatory variables. In other words, the intercept-only model tests the null hypothesis of no difference in mean level of weapon carrying across high schools in the sample. After the estimation of this preliminary model, multilevel results are presented that simply explore the bivariate relationship between each of the school-level explanatory variables (e.g., imported disadvantage) and the mean likelihood of weapon carrying. These bivariate results serve as a liberal test of the effects of school and community contextual variables on weapon carrying, for no steps are taken to

adjust for school differences in the composition of students. The chapter concludes by presenting and discussing results for fully-specified multilevel models. These findings serve to address the fundamental question of whether the imported community variables, as well as other school-level measures, have an effect on weapon carrying above and beyond student-level predictors.

RESULTS

Descriptive Results

Table 3.3 displays descriptive statistics for each of the student-level variables examined in this research. Once again, *six percent* of the students in the sample reported carrying a weapon to school in the 30 days prior to the interview. Roughly one-half of the adolescents were male, and the average age across the sample was approximately 16 at the time of the in-home interview. A particular benefit of the Add Health data is the availability of data to create fairly diverse categories for adolescents' race or ethnicity. In this research, four categories were generated for race/ethnicity wherein non-Hispanic Whites makeup the largest racial category by accounting for 65 percent of the sample. Interestingly, 30 percent of the adolescents reported being suspended from school at some point in their lives, while 36 percent indicated they missed at least one day of school that was not excused during the most recent academic year. Eleven percent of the students expressed that they did not feel safe in their neighborhood, while nine percent of the adolescents reported selling drugs in the year prior to the interview.

The school-level descriptive statistics displayed in Table 3.4 indicate that, on average, there were 233 students per grade across the high schools in the sample. The overwhelming majority of high schools were public institutions and roughly 45 percent of the schools were

located in the South. Fifteen percent of schools reported having an average daily attendance of less than 90 percent, and, in general, 13 percent of students in each school reported feeling unsafe while attending school. Here again, because of their skewed distributions, the imported community variables were logarithmically transformed, which has the effect of not making the descriptive statistics for these variables particularly meaningful. Therefore, when examined in its original metric, the average imported violent crime rate across the 55 high schools in the sample was 752 per 100,000 population. Interestingly, the violent crime rate for the United States was 747 per 100,000 population in 1993. At least with respect to violent crime, therefore, it appears that retained communities in the current sample are representative of the United States, even though select high schools were systematically removed from the sample (see Table 3.1).

Table 4.1 moves beyond univariate statistics by displaying weighted Pearson correlation coefficients for the student-level variables. In general, these coefficients provide a measure of association between any two variables in the table and serve to address whether any relationships among the student-level variables are highly collinear.[12] In addition, the direction and strength of these relationships also provides a preliminary test of the proposed hypotheses in Table 3.3. For example, is it actually the case that adolescents who have a stronger attachment to their parents are less likely to report carrying a weapon to school?

A close examination of Table 4.1 reveals a couple noteworthy findings. First, keeping in mind that insignificant relationships are underlined, Table 4.1 indicates that most of the relationships among the student-level variables are significant ($p < .05$), which is likely due in large measure to the overall size of the adolescent sample (N = 10,308). Second, even though

[12] Unweighted matrices also were estimated to examine bivariate relationships among the student and school-level variables. In general, the strength and direction of the relationships remained unchanged in these unweighted matrices.

most of the relationships are significant in Table 4.1, there is no indication that any two variables are highly collinear. In fact, no association in Table 4.1 has a coefficient that exceeds .6. As Allison (1999) pointed out, this proves important because highly collinear data generally results in large standard errors when estimating regression models; thus making it difficult to find statistically significant effects. Finally, with the exception of the significant relationship for non-Hispanic Whites, all the directional relationships initially proposed in Table 3.3 are supported. For example, there is a significant association between male adolescents and reported weapon carrying, as well as a significant relationship between involvement in problem behaviors (e.g., property crime and sold drugs) and weapon possession. Overall, the relationships displayed in Table 4.1 offer initial support for the importance of student characteristics in explaining school-based weapon carrying, and the strength and direction of the relationships are consistent with most of the research hypotheses.

A number of school-level variables are examined in this research in order to determine their effects on student weapon carrying. It is sometimes the case, however, that bivariate relationships at the contextual level are highly correlated, which makes it difficult to discern significant effects in statistical analyses. In their analysis of student misconduct in Philadelphia schools, Welsh et al. (1999) found a number of particularly strong bivariate relationships among their school-level variables. To determine whether such strong associations are present among contextual measures in this research, Table 4.2 displays the correlation coefficients for the school-level variables. Clearly, the strength of association among some of school-level variables is potentially problematic. In particular, the level of disadvantage in a school's attendance area is highly correlated with the percentage of students in a school who are Black. Also, the level of social disorder in a school is strongly associated

with extracurricular inactivity and the percentage of students who feel unsafe attending school. Overall, the strength of the relationships among some of the contextual variables indicates that including various combinations of these measures in a regression model simultaneously could be misguided. Accordingly, caution is taken when performing regression analyses not to concurrently test for contextual effects using various subsets of variables (e.g., imported disadvantage and percent Black).

Unconditional Model

As Duke (2004) indicated, the first step in constructing a multilevel model is determining whether one is even needed. Statistically this is generally undertaken by estimating a fully unconditional (or intercept-only) model, with subsequent results indicating whether there is significant variation in the outcome across contextual units. If it is determined that significant variation is *not* present across contextual units in the unconditional model, this signifies there is insufficient variability in outcome and thus no need to proceed with a multilevel analysis (Heck and Thomas, 2000); in other words, it would be appropriate to estimate results using single-level regression techniques.

Before estimating an unconditional model, however, Figure 4.1 displays the distribution of weapon carrying across the 55 high schools in the sample. This figure provides a graphical depiction of the level of variability in mean weapon carrying across the schools. The range of this distribution is from less than one percent to nearly fifteen percent; that is, one high school had less than one percent of their students report carrying a weapon to school, while another high school had nearly fifteen percent of their students report carrying. These two schools certainly signify that variation exists in the outcome, but, as depicted in Figure 4.1, many of the schools had a similar percentage of students report carrying a weapon.

For example, nearly one-half of the schools in the sample had three to six percent of their students report carrying a weapon. We also find, however, that 24 schools fall above the mean (6 percent) of the distribution, which is suggestive of meaningful between-school variability in weapon carrying.

Table 4.3 provides a more formal test of between-school variability in weapon carrying by presenting results from an unconditional multilevel model (i.e., no predictor or control variables). Most importantly, the significant variance component of .202 ($X^2_{(54)} = 150$, $p < .001$) for the level-2 random effect (b_{0j}) indicates that weapon carrying varies significantly across the 55 high schools in the sample.[13] Moreover, g_{00} represents the average log odds of weapon carrying across schools. Thus, for a school with a "typical" rate of student weapon possession, the expected log odds of weapon carrying is -2.780, which corresponds to an odds of exp(-2.780) = .062 or a probability of 1/(1 + exp[2.780]) = .058. This expected probability is identical to the observed prevalence of weapon carrying in the sample (5.8 percent). Given the estimated log odds and variance of weapon carrying displayed in Table 4.3, we would expect approximately 95 percent of the schools in the sample to have a mean log odds (b_{0j}) of weapon carrying between -3.66 and -1.99 (-2.780 ± 1.96 * $\sqrt{.202}$ = -3.66, -1.99) or probabilities that lie between .025 and .120. In referring back to Figure 4.1, the outer limits of this estimated confidence interval appear consistent with the observed mean level of weapon carrying across the high schools in the study sample.

[13] In an unconditional model with a standard linear outcome, one would find two additional statistics that are not presented in Table 4.3: a level-1 variance component (*r*ij) and an intraclass correlation coefficient. With regard to the level-1 variance component, Raudenbush and Bryk (2002) noted that the level-1 variance in a logistic regression model is not assumed to be homoscedastic for the variance is entirely determined by the mean. As a result, the level-1 variance is not particularly meaningful in log linear models. However, a level-1 dispersion parameter can be modeled in HLM, but supplemental analyses revealed that this estimated parameter was unwarranted (i.e., it was not substantially different from one and had no substantive effect on results). Moreover, because the level-1 variance is less informative in logistic regression models, the intraclass correlation (a ratio of the level-2 variance to the total variation) is also not especially meaningful.

The reliability estimate (?) for the intercept in Table 4.3 is .602 (not shown in table), which represents the pooled reliability across the 55 high schools in the sample. Raudenbush and Bryk (2002) defined the reliability as a ratio of the true (population) score to the observed score of the sample mean. Within the framework of the unconditional model in Table 4.3, the significant variance in mean weapon carrying observed across the schools is only meaningful or helpful insofar as the observed school means provide a reliable indicator of the school population means (Heck and Thomas, 2000). As a general rule of thumb, reliabilities that exceed .5 for the intercept (b_{0j}) are acceptable (Grunwald, Mayhew, and Dey, 2003), and scores closer to one are more desirable. Thus, a pooled reliability score of .6 for the school intercepts suggests that the observed school means are an acceptable indicator of the true population means. Raudenbush and Bryk (2002) pointed out that strong reliability scores (i.e., closer to one) result when the group means substantially vary across level-2 units, or the sample size per level-2 unit is large. The acceptable reliability observed here results more from the latter rather than the former; that is, the average number of students per school in the sample is fairly large ($\bar{x}$ = 187).

A few model specification issues deserve some clarification before proceeding. First, the nonlinear model presented in Table 4.3, as well as every model presented throughout this research, was estimated using a penalized quasi-likelihood (PQL) method. PQL is the default estimation method for nonlinear models in HLM (Raudenbush et al., 2004). As Raudenbush and Bryk (2002: 459) indicated, this estimation method is computationally advantageous for specified equations routinely converge and subsequent estimates are generally reliable so long as the level-2 variance is not especially large, which is not the case in this research (see Figure 4.1).

A more desirable method for estimating nonlinear models in HLM involves using second-order Laplace approximation. The Laplace method has proven desirable because estimates of model coefficients are more accurate than those produced using PQL (Raudenbush, Yang, and Yosef, 2000), and Laplace also computes a deviance statistic for logistic regression models estimated in HLM (Slocum, Simpson, and Smith, 2005). The deviance statistic is useful to test for significant differences in nested models (e.g., whether the addition of variables x1 and x2 have a null effect on a model; Long, 1997). Despite these noted advantages, Laplace approximation was not used in this research because standard errors are currently unavailable for variance components using second-order Laplace approximation in HLM (Ng et al., 2006). As a result, one cannot readily ascertain whether there is significant variation across contextual units in random effects. Of course, identifying whether meaningful variation in weapon carrying exists across high schools in the study sample is imperative to the objectives of this research.

Returning to Table 4.3, the results come from a unit-specific model with robust standard errors that was estimated using PQL. When using nonlinear link functions, such as the case here, HLM produces estimates for "population-average" and "unit-specific" models. As defined by Raudenbush and Bryk (2002), unit-specific models describe a process that is occurring in each level-2 unit. To be more precise, "Of central interest [with a unit-specific model] is the question of how these processes differ over a population of level-2 units" (p. 304). In contrast, population-average models cannot inform us about the distribution of the outcome (weapon carrying) across level-2 units (schools). Accordingly, unit-specific estimates are more appropriate for this research. Moreover, the unit-specific model in Table 4.3 was estimated with robust or "Huber-corrected" standard errors. HLM produces both

standard and robust standard errors when estimating linear or nonlinear models (Raudenbush and Bryk, 2002), but estimated results are only accompanied by robust standard errors when design or sample weights are applied. Thus, the unit-specific models presented throughout this research were estimated with robust standard errors.

Models of Level-2 Bivariate Effects

As a general practice, most multilevel studies proceed by introducing level-1 explanatory variables to examine their influence on the outcome (Hox, 1995). Given that the primary focus in this research is on the level-2 variables, however, this chapter proceeds by first examining the bivariate effect of each level-2 or school-level variable on mean weapon carrying. To be more precise, the results in Table 4.4 identify the distinct effect of each school-level variable (14 in total) on weapon carrying absent any controls (level-1 variables) for differences in the composition of students across the high schools. In other words, each school-level variable is modeled separately to identify whether it has a significant effect on the unconditional mean level of weapon carrying. This modeling strategy, in general, makes for a liberal test of contextual effects.

As displayed in Table 4.4, fourteen separate models were estimated, and for each:

γ_{00}: is the average log odds of weapon carrying across the study high schools when the level-2 variable is equal to zero;

γ_{01}: is the pooled fixed effect of the level-2 explanatory variable on the mean level of weapon carrying;

p: is the p-value for the fixed effect of γ_{01};

±1s: is the predicted probability of weapon carrying when the level-2 explanatory variable is one standard deviation below or above its mean; and

Variance: is the pooled unique effect of each school on mean weapon carrying holding the modeled level-2 explanatory variable constant.

Moreover, four of the school-level variables—urban, private, and southern school as well as student absenteeism—are dummy variables that were modeled in their original metric. For these variables, the -1s column represents the expected probability of weapon carrying when the level-2 variable equals zero, and thus the +1s column is the expected probability of weapon carrying when the level-2 variable equals one. The remaining level-2 variables were grand-mean centered. In the case of these variables, γ_{00} represents the average log odds of weapon carrying when the level-2 explanatory variable is equal to its mean.

In examining the *p*-value column in Table 4.4, we find that three school-level variables—*student absenteeism, fearful students, and physically fought*—are significantly associated with the mean level of weapon carrying across the high schools in the study sample. Regarding student absenteeism, the expected log odds of weapon carrying among students who attended high schools in which the average daily attendance exceeded 90 percent (coded zero) is -2.830 (γ_{00}), which corresponds to a probability of .056 (-1s). For those students who attended high schools in which the average daily attendance fell below 90 percent (coded one), however, their estimated probability of weapon carrying (.078) is nearly 40 percent higher.

With respect to the school-level variable of fearful students, the predicted probability of weapon carrying for students who attended schools with an average level of students fearing for their safety is .060 (1/[1 + exp{2.747}]). While for adolescents who attended schools in which students expressed greater concern about their safety at school (one standard deviation above the mean), their expected likelihood of weapon carrying is .066. Finally, the

percentage of youths estimated to carry a weapon to school where approximately one-half of students have been involved in a physical confrontation (either in or out of school) is nearly seven percent. However, when adolescents attended schools in which a little more than one-third of students participated in a physical fight, their anticipated likelihood of weapon carrying is only five percent.[14]

Each of the significant variables in Table 4.4 was presented in chapter three as a measure of the school *social system* or *culture*. Anderson (1982) noted the importance of such measures within the context of discussing theories of school climate. The other remaining measures of the school social system or culture—PTA participation, extracurricular inactivity, and social disorder—did not prove significant in explaining variability in mean weapon carrying, however. The school-level variables of PTA participation and social disorder also double as measures testing a basic premise of the school-as-communities perspective: the quality of interrelationships among school personnel, students, and other stakeholders (e.g., parents) are important in achieving desired school-based outcomes (Furman, 2002; Payne et al., 2003; Sergiovanni, 1993). As indicated, though, the level of social connectedness among students and teachers (social disorder), as well as parents and teachers (PTA participation), did not significantly reduce the prevalence of weapon carrying across schools in the current study sample.

Aside from being measures of the school social system, the three significant variables in Table 4.4 arguably share another common element as well. They each are to some extent

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[14] The standard deviation for the school-level variable physically fought is .06 ($\bar{x}$ = .44). Thus, a school in which one-half of the students reported fighting lies one standard deviation above the mean, and a school where 38 percent of students reported fighting lies one standard deviation below the mean.

consistent with arguments surrounding the fear of victimization hypothesis. Of course, instead of operating at the student-level, these variables represent contextual processes in Table 4.4. The connection to the fear of victimization hypothesis is most intuitively drawn with the school-level variable fearful students, although it is uncertain with this variable as to whether students' expressed fear for their "safety" is equivalent to actually fearing acts of victimization (i.e., formless fear). Also, it stands to reason that schools attended by a greater prevalence of students involved in physical confrontations will in turn have more students carrying a weapon to school in preparation for such encounters. On the other hand, it may be that schools attended by students with a greater propensity for violence inevitably have more students who carry a weapon, for weapon carrying may simply be an extension of delinquent or offensive activities (Brown, 2004; Simon et al., 1999; Webster et al., 1993). This argument is tested more directly when the student-level measures of problem behavior are examined.

Finally, Warr (2000) suggested that behavior modification (e.g., spatial shifting) may serve as a better indicator of perceived fear of victimization than cognitive measures of fear. As noted, one foolproof way to avoid being victimized at school is not to attend to school altogether. In Table 4.4, it was revealed that adolescents who attended schools in which 10 percent or more of students did not show up for school on any given day were more likely to have students carry a weapon to school. Similar to fearful students, however, it is uncertain whether student absenteeism in this case is a consequence of fearing in-school victimization, for as Lawrence (1998) noted, a number of factors have been linked with student nonattendance and dropout in the literature. Interestingly, the bivariate correlation between fearful students and student absenteeism in Table 4.2 is nearly .6, which is consistent with the

notion that a school's overall attendance level is attributable, in part, to their students' perceived vulnerability to in-school victimization.

The proposed connection between the significant contextual variables and the fear of victimization hypothesis is speculative, for there is no *direct* measure of in-school victimization or student fear related to in-school victimization examined in this research, but the measures of student absenteeism, fearful students, and physically fought seem consistent with this hypothesis. Notably, most studies in the literature have only examined the fear of victimization or protection hypothesis at the student-level, but there is some justification here for the application of this hypothesis at the school level as well.

Overall, the preliminary findings presented in Table 4.4 provide more direct support for particular measures of the school social system; thus highlighting the significance of dimensions of the school climate in shaping school-based outcomes (Anderson, 1982; Gottfredson, 2001). Moreover, although their directional relationship (+) with the outcome is consistent with initial predictions, each measure of the imported community *did not* account for significant variation in mean weapon carrying across the high schools in the sample. The first hypothesis proposed at the start of this chapter was:

> *Students who attend schools in communities that experience greater economic disadvantage, residential mobility, or violent crime will be more likely to disclose carrying a weapon to school, net of other predictors* (H_1).

Even in the absence of "other predictors," this hypothesis is not supported in Table 4.4. There is no preliminary support, therefore, for the contention that violence or structural conditions external schools affect the mean prevalence of school-based weapon carrying. Figure 4.2 better illustrates this conclusion by graphically displaying the relationship between

empirical Bayes estimates of the expected mean probability of weapon carrying and levels of imported community conditions.[15] The expected probability of mean weapon carrying for each high school was calculated from the unconditional model presented in Table 4.3. Moreover, a lowess fit line was plotted for each imported variable to better illustrate its relationship with mean weapon carrying. It is apparent in Figure 4.2 that none of the imported community variables have a strong linear relationship with mean weapon carrying. Indeed, the strongest bivariate correlation (*r*) between an imported community variable and mean weapon carrying is .15, and *none* of the relationships are significant.

It is fairly clear in Figure 4.2 that imported disadvantage and mobility appear, for the most part, unrelated to the mean level of weapon carrying and thus not supportive of the spillover hypothesis. With the level of violent crime, however, the lower one-half of the distribution appears to exhibit a positive, linear relationship with weapon carrying, whereas the upper one-half of the distribution, with a few exceptions, reveals a negative association with weapon carrying. The issue of nonlinearity with the imported community variables was explored more formally by re-estimating bivariate multilevel models, but this time the continuous imported measures were recoded as dummy variables that distinguished whether schools were one standard deviation below the mean (reference category), within one standard deviation of the mean, or one standard deviation above the mean on each community condition. Using these dummy coded variables, the estimated results (not shown) confirmed prior findings by revealing no significant differences in mean weapon carrying across these binary measures.

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[15] Empirical Bayes (EB) estimates take into account the precision (i.e., reliability) of each school's mean. For example, if the sample mean for a school is determined to be highly unreliable, the grand mean, as opposed to the within-school mean, is given more weight in computing its EB estimate. As a result of this weighting procedure, EB estimates are sometimes called "shrinkage estimates" for as reliability worsens the EB estimate will "shrink" toward the grand mean (Luke, 2004).

Table 4.5 displays the expected probability of mean weapon carrying for schools based on their deviation from the grand-mean levels of violent crime, disadvantage, and mobility. We again find that these predicted probabilities are in the hypothesized direction; that is, greater violent crime, disadvantage, or mobility corresponds to a greater likelihood of weapon carrying, but these probabilities are not significantly different from one another.[16] Here again, even in the absence of other theoretically relevant control variables, the results in Table 4.5 provide no supportive evidence that external community conditions discernibly affect the level of student weapon possession in schools.

Returning once more to Table 4.4, the "variance" column indicates that there is no single level-2 variable that reduces the between-school variability in weapon carrying to insignificance. This indicates that significant variation in mean weapon carrying is still present across the high schools in the sample. Some of this variation may be a product of compositional differences in the students who attend these schools. For example, Wilcox and Clayton (2001) found a 65 percent reduction in between-school variation in weapon carrying across a sample of Kentucky schools after modeling individual-level variables that controlled for student characteristics (e.g., gender and age). They concluded that "Apparently the individual-level factors measured here approximate school-level structures or processes, and thus account for a great deal of the cross-school variation in students' weapon carrying" (p. 528).

Accordingly, this chapter proceeds by presenting multilevel models that introduce individual-level variables to capture the sociodemographic characteristics of students. In addition, each of the school-level variables is modeled separately once again after adjusting

[16] An additional bivariate multilevel equation was estimated in which the linear measure of violent crime (logged) was modeled with a measure representing violent crime squared. Results revealed that neither of these variables had a significant effect on mean weapon carrying.

for between-school differences in student sociodemographic characteristics. Even though most of the school-level variables did not exert a significant effect on mean weapon carrying in the bivariate multilevel models in Table 4.4, it may still be possible for these level-2 variables to have a significant effect on mean weapon carrying after adjusting level-1 predictors (i.e., suppression effect). When the level-1 variables are grand-mean centered (the strategy used here), the between-school variance is adjusted for the level-1 predictors (Hofmann and Gavin, 1998). As a result, the expected grand mean (γ_{00}) of the outcome may shift and so the distribution of schools around the grand mean can take on a different form.

This point is illustrated in Figure 4.3. The bar graph in the top portion of the figure rank orders the Empirical Bayes (EB) residuals from the unconditional model in Table 4.3 for each high school (N = 55). The bar graph in the bottom portion of Figure 4.3 displays the EB residuals from a multilevel model that included student-level variables for sociodemographic characteristics (model not yet shown). For purpose of comparison, the EB residuals in the bottom portion of Figure 4.3 were then sorted based on the order of schools in the top portion of the figure. Therefore, the first bar from the left in each graph, for example, represents the same school (059). As can be seen, the distributional form of the level-2 unexplained variance in the conditional sociodemographic model is slightly different than the level-2 unexplained variance in the unconditional model. For instance, the residual value for school 039 (first bar from the right) in the sociodemographic model is substantially smaller (.4) than what is found in the unconditional model (.8). Thus, the introduction of level-1 variables alters the between-school variance in weapon carrying, which makes it possible for level-2 suppression effects to be found.

Conversely, the three significant school-level measures found in Table 4.4 – student absenteeism, fearful students, and physically fought – may be rendered insignificant after accounting for student-level predictors. Returning to Figure 4.3, we find that, when altered, level-2 residual values are more often than not pulled closer to zero after adjusting for student characteristics. Consequently, there is less variance in mean weapon carrying to be potentially explained by school-level predictors (e.g., student absenteeism).

Models with Sociodemographic Characteristics

Panel A in Table 4.6 is a multilevel model in which the effects of level-1 sociodemographic characteristics on in-school weapon carrying were estimated. There were no school-level effects estimated in Panel A, however. Moreover, each of the student-level variables was grand-mean centered. Thus, the intercept or grand mean (?$_{00}$) for the model represents the log-odds of an "average" student, based on the level-1 characteristics modeled, from a typical school ($u_{0j} = 0$) carrying a weapon to school (-2.930). In this case, the expected probability of such a student carrying a weapon to school is 1 / (1 + exp[2.930]) = .051.

We also find that two of the student-level characteristics are significant. First, and highly consistent with prior research, the odds of a male carrying a weapon to school were more three times greater (3.556) than odds of a female carrying a weapon. In addition, the findings indicate that a one unit increase on the parent education scale (e.g., moving from non-graduate to high school graduate) results in a nearly 10 percent reduction (100 * [1 - .903]) in the odds of a student taking a weapon to school. The "random effects" portion of Panel A provides a formal test as to whether significant variation in mean weapon carrying still exists across the high schools in the sample after adjusting for the modeled

sociodemographic characteristics. Although the introduction of the level-1 variables reduces the level of between-school variance initially found in the fully unconditional model (from .202 to .188), results indicate that meaningful variation in mean weapon carrying is still present across the high schools.

Panel B individually models the school-level variables in order to address whether these measures account for significant between-school variation in mean weapon carrying. In each of the 14 models displayed in Panel B, the student-level characteristics listed in Panel A were estimated as well, but their effects are not shown. This was done because the fixed effects in Panel A remain unchanged regardless of the school-level variable modeled.

In examining Panel B, we find that only one school-level variable—*fearful students*—is a significant predictor of mean weapon carrying after adjusting for school differences in student sociodemographic characteristics. Thus, the school-level variables of *student absenteeism* and *physically fought* no longer exert a significant effect on mean weapon carrying. The coefficient for fearful students is far from trivial (2.537). Indeed, it is estimated that, holding constant sociodemographic characteristics, a one unit increase in students fearing for their safety increases the expected mean odds of weapon carrying for a school, on average, by a factor of nearly 13. More specifically, after adjusting for socioeconomic characteristics in Model 10, the predicted mean probability of weapon carrying for students who attended the high school with the *least* expressed fear is .039, whereas the expected probability for students who attended the high school with the *most* expressed fear is .091. Furthermore, the introduction of the school-level variable fearful students reduces the level-2 variance in mean weapon carrying from the Panel A model by approximately 12 percent ([.188 - .166] / .188 * 100).

There is no indication of a suppression effect with any of the level-2 variables. That is, variables which were not significant in the bivariate models but were significant after adjusting for sociodemographic characteristics. Thus, the imported community variables once again have no significant effect on mean weapon carrying in the sample. In fact, the level-2 variance from the Panel A (.188) model slightly increased after estimating the separate fixed effects for imported disadvantage (.193), mobility (.193), and violent crime (.194). Although not initially addressed, this increased variance effect also occurred in the bivariate models (Table 4.4) for the imported community variables. That is, the level-2 variance observed in the fully unconditional model actually increased after modeling the imported community measures.

It intuitively makes little sense that the residual variance in mean weapon carrying would in fact increase after modeling a level-2 explanatory variable. But as Raudenbush and Bryk (2002: 150) remarked, "We note that it is mathematically possible under maximum likelihood estimation for the [level-2] residual variance to increase slightly if a truly nonsignificant [level-2] predictor is entered into the equation." In addressing a similar issue, Snijders and Bosker (1999: 104) noted that such an unexpected increase in level-2 variance generally results from two possibilities: "…either this is a chance fluctuation, or the larger model is misspecified."

First, and as confirmed in Figure 4.2, the imported community variables have a rather weak association with mean weapon carrying. Based on the noted statement by Raudenbush and Bryk, therefore, it is plausible that the increase in level-2 variance after modeling level-2 predictors is a statistical or mathematical artifact. It seems highly unlikely, however, that this finding is a result of "chance fluctuation," for approximately one-half of the level-2 variables

in Table 4.6 slightly increase the variance after being estimated. By a process of elimination then, it is more likely the case that entering the imported community variables, as well as other level-2 variables, into the larger equation leads to model misspecification. In general, Snijders and Bosker (1999) suggested that such a finding should serve as a "diagnostic" tool, which would ultimately lead to the removal of these level-2 variables from the multilevel model if the objective is estimating an equation that accounts for the most between-unit variation.

Overall, the findings presented in Table 4.6 lead to a few general conclusions. First, gender is an especially significant factor in determining the likelihood of whether a student reports carrying a weapon to school, whereas characteristics such as age, race, and ethnicity prove insignificant. Moreover, the imported community variables once again are not significantly associated with mean weapon carrying. In fact, the introduction of each of the imported variables tends to compromise the overall quality of the multilevel model. After adjusting for differences in sociodemographic characteristics, the only school-level variable that sustained statistical significance was fearful students. Even after accounting for this variable, however, significant variation in mean weapon carrying still exists across high schools in the sample. The next section addresses whether this finding holds true after adjusting for additional student-level variables such as school attachment and involvement in problem behaviors.

Models with Fully Specified Level-1 Equation

Panel A of Table 4.7 presents results for the fully specified level-1 model absent any estimation of level-2 effects. Each of the student-level variables was grand-mean centered once again. Among the sociodemographic variables, we find that gender maintains

significance while parent education is no longer statistically meaningful. Thus, the student-level measures of age, race/ethnicity, and SES do not exert a significant effect on the log odds of school-based weapon carrying.

Panel A also provides some level of support for social control theory in that a stronger attachment to parents and school significantly reduces a student's likelihood of carrying a weapon to school. Specifically, a one-unit increase in parental or school attachment reduces the odds of an adolescent carrying a weapon to school by approximately five percent. It is interesting to note, however, that the other two measures of school attachment examined here—prior school suspension and unexcused absence(s)—are not significant determinants of student weapon possession. Relative to the school attachment scale, the level-1 variables of school suspension and unexcused absence are single-item indicators and, in general, measure temporally more distant behaviors, which may account for their insignificance. In addition, there is no indication in Panel A that academic performance (i.e., GPA) is related to school-based weapon carrying after holding the other predictors constant.

Notably, there is no support in Table 4.7 for the contention that expressed fear is a motivating factor to carry a weapon. In other words, the level-1 measures of school and neighborhood fear are not significant determinants of in-school weapon possession. Again, these measures are single-item indicators of cognitive fear that do not ask about fear of specific types of victimization (e.g., physical assault). It is found, however, that being a victim or witness of a weapon crime (in or away from school) is significantly associated with school-based weapon carrying above and beyond the estimated effects of problem behaviors. To be more precise, the odds of a student carrying a weapon to school are more than two times greater if they reported being a victim or witness of a weapon crime in the year prior to

the interview. It appears, therefore, that actual risk of weapon victimization is a more influential factor than perceived school or neighborhood fear when students decide to carry a weapon to school.

The three measures of involvement in problem behaviors are also significant predictors of weapon carrying in Table 4.7. Namely, students who reported some level of participation in property crime, interpersonal violence, or illicit drug sales were more likely to disclose taking a weapon to school. Accordingly, results presented here are not inconsistent with the claim that weapon carrying is simply an extension of a broader involvement in antisocial behaviors.

We also find in Panel A that two of the three control variables examined are significantly associated with the outcome. That is, the proxy used for delinquent peer association—peer drug use—is unrelated to weapon carrying after accounting for the other theoretically relevant variables, whereas the student-level measures of depression and household handgun availability are significant. Holding the other level-1 measures constant, a one standard deviation increase on the depression scale corresponds to a 23 percent increase in the odds of a student carrying a weapon to school ([exp{.048 * 4.27} – 1] * 100). Furthermore, students who reported access to a handgun in their residence were nearly 80 percent more likely to possess a weapon at school.

As noted, some recent school shooting incidents have raised concerns that emotionally maladjusted adolescents are at greater risk of perpetrating weapon violence in schools. There obviously is some level of support for this claim in Table 4.7. Regarding the measure of household handgun availability, the precise social process at work here is not entirely clear. It may be that students with ready access to a handgun in the home are more likely to carry due

to their greater ease in acquiring a gun. It would also be consistent with the literature to contend that households containing handguns are more likely to support the use of weapons for reasons of self-protection. In either case, the effect of the measure of household handgun availability is fairly robust in Table 4.7.

In examining the "random effects" portion of Panel A, we once again find that the unexplained variance in mean weapon carrying (u_{0j}) increases after modeling the additional level-1 variables. That is, the estimated variance component for the model containing just the sociodemographic variables is .188 (Panel A, Table 4.6), while the estimated variance component for the student-level equation in Table 4.7 is .217. It is not uncommon to find multilevel analyses in the literature in which the introduction of a level-1 explanatory variable(s) actually increases the contextual variance (see e.g., Fearn, 2003; Ulmer and Johnson, 2004; Weidner, Frase, and Schultz, 2005; Wilcox Rountree, 1998).

Snijders and Bosker (1999: 229) indicated that an increase in unexplained level-2 variance may result when the newly modeled level-1 variable(s) is uncorrelated with the other fixed effects in the equation, and the level-1 variable(s) is evenly distributed across the level-2 units. Among the newly modeled level-1 variables in Panel A (e.g., GPA), most of these measures are not strongly correlated with each other or sociodemographic variables in the equation (see Table 4.1), and a number of these variables are, for the most part, evenly distributed across the schools in the sample (e.g., parental attachment and peer drug use). Given these empirical circumstances, it is not entirely surprising to find an increase in the variance of mean weapon carrying (u_{0j}) with the addition of the level-1 variables in Table 4.7.

Regarding the level-2 variables in Panel B, it is found that the measure of fearful students is no longer significant after adjusting for the additional level-1 variables. In fact,

none of the school-level variables exert a significant effect on mean weapon carrying after simultaneously modeling all the student-level characteristics. The only school-level measure that approaches significance in Panel B is Southern school ($p < .1$), which is captured in the noticeable reduction in unexplained variance after modeling this variable (from .217 to .187).

SUMMARY

There were three hypotheses initially proposed at the start of this chapter. The first hypothesis was:

> *Students who attend schools in communities that experience greater economic disadvantage, residential mobility, or violent crime will be more likely to disclose carrying a weapon to school, net of other predictors* (H_1).

Throughout all analyses undertaken in this chapter, there was no support for this hypothesis. Even when not adjusting for differences in student-level characteristics, the measures of imported disadvantage, mobility, and violent crime were unrelated to mean weapon carrying across the high schools in the sample (see Table 4.4 and Figure 4.2). Accordingly, this research offers no support for the spillover hypothesis in that external community conditions did not discernibly affect the mean prevalence of school-based weapon carrying in the sample.

The second hypothesis posed was:

> *Contextual measures of a school's ecological environment and social system will have no effect on student-weapon carrying after controlling for imported community conditions* (H_2).

In the bivariate analyses (Table 4.4), it was revealed that the school-level variables of student absenteeism, fearful students, and physically fought were significantly associated with the

level of weapon carrying in a school, while additional measures of a school's ecological environment or social system (e.g., PTA participation) were not significant. The level of expressed fear on the part of students was the only school-level variable that sustained significance after adjusting for differences in the sociodemographic makeup of schools. Student absenteeism, along with the other school-level measures, was rendered insignificant after adjusting for all the student-level variables, however. Thus, if the above hypothesis was restated such that it was proposed that measures of a school's ecological environment and social system will have no effect on weapon carrying after controlling for *student-level* characteristics, the hypothesis would be supported. The important point here is that select contextual measures of a school's environment and social system were rendered insignificant as a result of adjusting for student-level characteristics and not a result of accounting for imported community conditions.

The final hypothesis proposed was:

Males and adolescents involved in problem behaviors will be more likely to report carrying a weapon to school, net of other predictors (H_3).

Consistent with prior research, this hypothesis was well supported in this study. Controlling for other relevant variables, it was found that males were more than two and one-half times more likely than females to carry a weapon to school. And measures of student involvement in problem behaviors—interpersonal violence, property crime, drug selling—were also significant predictors of taking a weapon to school.

Additional student-level variables that proved significant in explaining school-based weapon carrying included a student's attachment to their parents and school, which provides some level of support for social control theory. It was also discovered that students

expressing greater feelings of depression were more likely to carry a weapon to school, and adolescents residing in households in which a handgun was accessible were also more prone to report taking a weapon at school.

Overall, current results provide no conclusive support for the spillover hypothesis for weapon carrying in this sample is primarily related to student-level characteristics (see also Wilcox and Clayton, 2001). In fact, none of the imported community variables were significantly related to mean weapon carrying, even in the absence of control measures for student-level attributes (e.g., race). Preliminary analyses did find, however, that some measures of a school's social system were statistically important, but these effects were eventually mediated after accounting for student-level characteristics. The next chapter examines the robustness of these findings by limiting the outcome to school-based gun carrying among male students in the sample.

CHAPTER 5

GUN CARRYING RESULTS

INTRODUCTION

The outcome of interest in the prior analyses was school *weapon* carrying. It was argued in the first chapter that the examination of school weapon carrying is important because if a student is victimized or perpetrates a crime at school with a weapon it is much more likely to be completed with a non-firearm weapon. Consequently, research limiting its focus to only gun-related activities at school fails to capture more common weapon-related behaviors that occur in school.

Some research, however, has found meaningful differences in the variables that predict gun carrying versus non-gun carrying. With student-level variables, for instance, DuRant et al. (1999) found in a sample of middle school students that minorities were more likely than White students to report carrying a firearm to school, but minority students were no more likely than White students to report carrying a non-firearm weapon to school. These researchers also found no association between team sports participation and school gun carrying, but these researchers did find a significant relationship (-) between team sports involvement and taking a knife or club to school.

With weapon carrying in general (not just specific to school) among a sample of male junior and senior high school students, Sheley and Wright (1998) found that Hispanic students were more likely than White students to report carrying a gun in the year prior to the survey, but Hispanic students were no more inclined than White students to report carrying a knife. A similar finding was found for involvement in drug sales as well; that is, students who participated in drugs sales were more likely to report carrying a gun, but these students were

no more likely to report carrying a knife. Collectively, these findings suggest that the effects of some student-level characteristics on weapon carrying may vary in terms of their strength or significance depending upon the type of weapon carrying (i.e., firearm vs. non-firearm) being examined.

There is also some indication in the literature that the effects of contextual variables meaningfully vary in strength based on the type of weapon carrying being explored. For example, Cook and Ludwig (2004) made a distinction between gun and non-gun carrying when examining these behaviors among a national sample of adolescent males. In estimating single-level logistic regression models, they found that males residing in counties in which the gun suicide (a proxy for gun availability) and robbery rates were higher were more likely to report carrying a gun, but the prevalence of gun suicides did not affect whether adolescent males carried a weapon other than a gun. More importantly, Cook and Ludwig (2004) found that, among *only* males who reported carrying a weapon, the robbery rate and percentage of suicides completed with a gun in a county were significant in isolating males who reported carrying a gun versus a non-gun weapon. Thus, this finding suggests that community conditions are more strongly associated with gun carrying than other forms of weapon carrying (e.g., knife).

Although Molnar and colleagues (2004) did not examine non-firearm weapon carrying in their multilevel analysis, they did find that youths (aged 9 to 19) residing in Chicago neighborhoods with greater physical or social disorder were more likely to report carrying a concealed firearm at some point. In addition, youths residing in neighborhoods where residents felt it is was safe for children to play or exhibited greater collective efficacy were less likely to report carrying a concealed firearm. Collectively, even though the studies of

Cook and Ludwig (2004) and Molnar et al. (2004) did not examine school-based gun carrying specifically, their findings suggest that the spillover hypothesis may be more applicable when the outcome of interest is gun carrying rather than the more general behavior of weapon carrying.

As noted, when students do carry a weapon to school, it overwhelmingly tends to be a weapon other than a gun (Addington et al., 2002). Presumably, from an opportunity perspective, most any student has access to a weapon other than a gun that can be easily concealed, such as a pocket or utility knife. It is reassuring to find, therefore, that on a national level only a very small number of students decide to carry a weapon to school on any given day. Within the context of the spillover hypothesis, it may be that a relatively similar proportion of delinquent-prone adolescents carry a weapon to school irrespective of the contextual environment in which they find themselves, for, as noted, obtaining *any* weapon likely requires little effort on the part of these students.

In the case of gun carrying, however, there are presumably more obstacles in place in order for students to acquire a gun to take to school. For instance, we know that, in theory, juveniles must acquire guns in the secondary market for it is illegal for them to acquire a gun on their own in the retail market (Cook and Ludwig, 2004). Moreover, research indicates that most adolescents who obtain a gun for non-recreational purposes (e.g., protection) do not acquire the firearm from home (Molnar et al., 2004; Sheley and Wright, 1995). Accordingly, adolescents would have to acquire a gun through informal social networks outside the home, such as family, friends, or acquaintances, or they would have to steal a gun (see e.g., Sheley and Wright, 1995; Smith, 1996). In the case of the former, adolescents would have to interact to some extent with persons willing and able to supply them with a gun for permanent or

temporary use. Such informal networks seem less important in the case of acquiring a non-firearm weapon given their widespread availability regardless of who adolescents interact with. In the latter case, youths who feel compelled to steal a gun presumably find themselves in an environment in which a non-firearm weapon does not satisfy their perceived need for a weapon.[17] One such environment may include neighborhoods or communities where other residents commonly carry guns or levels of serious violence are high. In such an environment, adolescents who carry non-firearm weapons presumably make themselves vulnerable to the proverbial problem associated with carrying a knife to a gun fight.

The point here is that, relative to student weapon carrying, external community conditions (e.g., level of violent crime) may have a more discernable effect on adolescent gun carrying by way of exposing youths to residents more amenable and able to informally provide a gun, as well as increase the perceived need for a gun for purposes of effective self-protection. As mentioned, these issues seem less pertinent in the case of weapon carrying for the opportunity to acquire a non-firearm weapon versus a firearm is likely less variable (i.e., fairly constant across all communities), and the motivation or perceived need to obtain a gun in particular for self-protection (or other reasons) is arguably shaped more so by community conditions.

The primary objective of this chapter, therefore, is to once again test the hypotheses proposed in chapter four, but the outcome in this chapter is school-based *gun carrying*. The analyses in this chapter address the robustness of the findings presented in the previous chapter by examining whether external community conditions continue to have a null effect when the outcome is in-school gun possession. Here again, some current research suggests

[17] Of course, an adolescent may steal a gun for purely economic gain as well; that is, steal a gun then turn around and sell it for cash or some other desired commodity.

that community effects may be more discernable when the dependent variable is gun carrying (see e.g., Cook and Ludwig, 2004).

Along with testing the same hypotheses, the identical modeling strategy is employed in this chapter as well. First, a fully-unconditional multilevel model is estimated in order to address whether there is significant variation in mean gun carrying across the high schools in the study sample. Second, multilevel results are presented for the models that estimate the distinct effect of each school-level variable on mean gun carrying absent any adjustment for school differences in student-level characteristics. Thereafter, the student-level sociodemographic variables are modeled followed by the fully-specified level-1 equation, which includes variables that account for such activities as involvement in problem behaviors. Before estimating these models, however, this chapter proceeds by first discussing the modified sample used to examine in-school gun carrying and a shortcoming of the dependent variable used in the analyses.

SAMPLE AND DEPENDENT VARIABLE

Sample

In the previous chapter, the multilevel analyses were conducted with a sample of male *and* female high school students. As noted, one of the most consistent student-level predictors of school weapon or gun carrying is gender (Brown, 2004), and results presented in chapter four were consistent with this finding. That is, males in the sample were more than two and one-half times more likely than females to carry a weapon to school, holding constant for a number of other relevant variables. Thus, if female students were removed from the sample, the base prevalence of school weapon carrying would increase from approximately six percent to more than nine percent. Conducting analyses with female students in the

sample, therefore, noticeably restricts the level of variance observed in the outcome. In the case of weapon carrying, however, we still found significant variation across schools in the mean level of weapon carrying even though female students were retained in the sample (see Table 4.3).

Now that the current focus turns to in-school gun possession, however, it becomes more problematic to retain female students in the research sample, for the prevalence of school gun carrying among females is less than one quarter of one percent. Consequently, there is very little variance in gun carrying that can be partitioned across high schools. The decision was made, therefore, to remove female students from the sample in order increase the observed variance in the outcome. Of course, the prevalence of school gun carrying among males is rather limited as well. Specifically, only two percent of males in the sample reported carrying a gun to school in the 30 days prior to the in-home interview.

In general, it may seem unreasonable to estimate multilevel models given the limited variability in the outcome. Stated differently, would one expect to find significant variability in mean gun carrying across 55 high schools when the prevalence of this behavior is only two percent? Molnar and colleagues (2004) examined concealed firearm carrying among a sample of youths (N = 1,842) residing in 218 Chicago neighborhoods, and only three percent of these adolescents reported they had carried a concealed firearm at some point. Despite this limited variability in gun carrying to partition across 218 neighborhoods, Molnar and colleagues (2004) still found significant neighborhood effects (e.g., collective efficacy) when estimating multilevel models. In other words, there was statistically meaningful variation in gun carrying across contextual units that could be accounted for by neighborhood-level predictors. In light of this finding, it is certainly possible that significant variation exists in

mean gun carrying across the high schools in the current sample, even though the prevalence of this behavior among male students is quite limited.

Dependent Variable

In the previous chapter, the dependent variable—weapon carrying—was constructed from an interview item in which adolescents were asked on how many days they had carried a weapon to school in the last 30 days. For purposes of this research, a binary outcome variable was created from this question that distinguished students who had or had not carried a weapon to school during the referenced timeframe. For those adolescents who indicated they had carried a weapon to school at least once, they were then asked in the in-home interview, "During the past 30 days, what one kind of weapon did you carry *most often* to school" (emphasis added). Nearly two-thirds of the carriers (both males and females) indicated that they had carried "a knife or razor" most often, while approximately 18 percent of the carriers disclosed carrying a handgun or gun most frequently.

It was noted above that two percent of males in the sample had carried a gun to school in the 30 days prior to the in-home interview. In this case, this percentage represents males who had carried a gun *most often* to school (coded one). Thus, it is possible that a male student carried a gun to school in the 30-day reference period, but carried a weapon other than a gun more often. Consequently, such adolescents are coded the same as non-firearm carriers and non-carriers (coded zero) in the multilevel analyses conducted in this chapter. Although this outcome variable treats *some* gun carriers as otherwise, it likely affects a very small number of males in the sample given the uncommonness of weapon carrying in general. Statistically, therefore, this shortcoming likely has little to no substantive effect on the findings. This chapter proceeds by presenting results for multilevel analyses. Once again, the

same series of multilevel models is estimated in this chapter, but *school gun carrying* serves as the binary outcome in the models discussed below.

RESULTS

Unconditional Model

Table 5.1 displays the results from an unconditional multilevel model of school gun carrying. Despite the limited variability in this outcome, we find that the variance component of 0.429 ($X^2_{(54)} = 110$, $p < .001$) for the level-2 random effect (b_{0j}) is statistically significant. This finding indicates that there is significant variation in mean gun carrying across the 55 high schools in the sample. Moreover, contrary to the unconditional model estimated in chapter four, a level-1 dispersion parameter was estimated (r_{ij}) in the unconditional model here. The variance component for the level-1 dispersion parameter (0.681) is substantially different from one (the expected or assumed value), and multilevel models estimated without the dispersion parameter have a meaningful effect on the findings and subsequent conclusions. Consequently, a level-1 dispersion parameter is estimated in each of the multilevel models presented in this chapter. Moreover, the expected log odds of gun carrying (g_{00}) across the high schools in the sample is -3.991 in Table 5.1, which corresponds to an expected probability of 1/(1 + exp[3.991]) = 0.019. The estimated probability of school gun carrying, therefore, closely parallels the observed prevalence of this behavior in the sample (two percent).

Aside from the outcome, one item that is notably different for the unconditional model in Table 5.1 compared to the unconditional model for weapon carrying is the estimated reliability (?) for the school intercepts (b_{0j}). Specifically, while this estimate in the unconditional model for weapon carrying was .602, the pooled reliability estimate for gun

carrying is only .429. Here again, this estimate serves as a measure of how well the observed school means (for gun carrying) provide a reliable indicator of the true population means (Heck and Thomas, 2000). Scores falling below the accepted threshold of .5 for the intercept (b_{0j}) are of some concern (Grunwald et al., 2003), but, relative to the analyses for weapon carrying, it is not surprising to find that the pooled reliability estimate for gun carrying is smaller. That is, there are fewer respondents per school on average ($\bar{x}$ = 93) given the male only sample, and there is less variance in the outcome that can be partitioned across schools. These are two issues that generally determine the overall quality of reliability scores (Raudenbush and Bryk, 2002).

The empirical consequence of having a less acceptable reliability is that, on average, the EB estimates (or shrinkage estimates) for each school's mean level of gun carrying will be pulled more toward the grand mean (see Luke, 2004); thus reducing the school-level variance in gun carrying. In other words, it becomes more difficult to discern contextual or school-level effects. In the end, however, we still find significant variation in mean gun carrying across the 55 high schools in sample. For instance, some high schools in the sample had no male students report carrying a gun to school, while two high schools had slightly more than seven percent of their male students report carrying a firearm. The next section of this chapter attempts to explain these differences in mean gun carrying by modeling each of the school-level variables individually (e.g., imported disadvantage), while *not* adjusting for school differences in student-level characteristics (e.g., race).

Models of Level-2 Bivariate Effects

Table 5.2 presents the bivariate effects for each of the school-level variables on mean gun carrying. In the previous chapter, we found that three variables—student absenteeism,

fearful students, and physically fought—were meaningfully related to school weapon carrying in the bivariate models. Results in Table 5.2 reveal that these very same variables prove significant in explaining mean gun carrying as well ($p < .05$). For example, the expected probability of weapon carrying for adolescents attending a school where students expressed greater fear (one standard deviation above mean) is .025, whereas the expected probability for adolescents attending a school with less fear is .014. Two additional variables in Table 5.2 border on significance as well ($p < .1$). They include the school-level variables of percent Black and urban school. That is, findings reveal that students attending schools in which a greater proportion of students are Black or are located in an urban area are more likely to report carrying a gun to school.

Most importantly, findings in Table 5.2 indicate that the imported community measures are not significantly related to mean gun carrying. As addressed, some research has found that contextual measures are stronger determinants of gun carrying than non-gun carrying (e.g., Cook and Ludwig, 2004), but results estimated here do not support this finding. In fact, findings presented in Table 5.2 tend to closely parallel the results presented in chapter four. Namely, there is no support for the contention that external community conditions (i.e., levels of disadvantage, mobility, and violent crime) ultimately determine the level of weapon or gun carrying in high schools in the sample. Accordingly, findings once again provide no support for the spillover hypothesis, for the three significant variables in Table 5.2 are measures of the internal dynamics of schools (i.e., measures of the social system) and are not measures of the external community environment in which the sample high schools operate.

In keeping with the modeling strategy utilized in the previous chapter, the next section introduces multilevel models that adjust for school differences in student sociodemographic

characteristics. Adjusting for school differences in these characteristics (e.g., race) rendered two of the three meaningful school-level predictors of weapon carrying insignificant (i.e., student absenteeism and physically fought) in the previous chapter. Findings examined below address to what extent the results for gun carrying adhere to this same pattern.

Models with Sociodemographic Characteristics

Panel A in Table 5.3 presents the within-school effects of the student sociodemographic characteristics on the log odds of carrying a gun (most often) to school, absent any estimation of level-2 effects. Of course, there is no need to estimate an effect for gender in this model given the male only sample. Furthermore, each of the student-level variables modeled in Panel A was grand-mean centered.

The findings for weapon carrying in the previous chapter revealed that, aside from gender, parent education was the only other sociodemographic characteristic significantly associated with weapon carrying. With gun carrying, however, we find that Hispanic students were more likely to carry a gun to school than White students (reference category). And students residing in single-parent households were more than two times likely to report taking a gun to school than adolescents residing in two-parent households.

The variance component for the level-2 random effect (u_{0j}) reveals that adjusting for the student sociodemographic characteristics increases the observed variance in mean gun carrying from 0.429 in the unconditional model (Table 5.1) to 0.556 in the current model (Panel A, Table 5.3). Here again, although finding an increased variance effect is not all that intuitive, it is statistically possible for this effect to occur (see Snijders and Bosker, 1999, p. 229 for a discussion of this issue). For purposes here, the most important aspect of the level-2

variance in Panel A is that, after adjusting for sociodemographic differences, there still remains significant variation in mean gun carrying across the 55 high schools in the sample.

Panel B in Table 5.3 presents results from models estimating the distinct effect of each school-level variable on mean carrying, holding constant for student sociodemographic characteristics. Because the effects of the student-level variables (e.g., age) remain unchanged when modeling any of the school-level variables, the coefficients for these variables are simply not shown in Panel B. Most notably, the findings in Panel B reveal that, after controlling for sociodemographic differences, none of the school-level variables exert a significant effect on mean gun carrying. Relative to the bivariate findings in Table 5.2, therefore, the variables of student absenteeism, fearful students, and physical fought are no longer statistically significant. Moreover, although their directional relationship (+) with mean gun carrying is consistent with expectations, the estimated effects for each of the imported community measures still remain insignificant. In general, findings displayed in Table 5.3 offer no support for contextual arguments (e.g., spillover and schools-as-communities perspectives) in explaining between-school variability in school gun carrying. These null effects are not entirely attributable to an absence of meaningful variance, however, for each of the variance components displayed in Panel B indicate that significant variation in school gun carrying is still present across high schools.

The final multilevel models examined in this chapter adjust for the remaining student-level characteristics. In particular, measures accounting for such issues as one's attachment to parents and school, as well as one's involvement in problem behaviors are examined. Findings in the previous chapter revealed that such variables proved significant in predicting a student's likelihood of carrying a weapon to school.

Models with Fully Specified Level-1 Equation

Table 5.4 displays the estimated effects of all the student-level measures on the log odds of school gun carrying. In the sociodemographic model, we found that Hispanics and males residing in single-parent households were more likely to carry a gun to school. After modeling the additional student-level variables, however, we find that these two measures are no longer significant in Table 5.4. Instead, the estimated effect for Black males is the only sociodemogragphic variable that is significant. Specifically, Black males were nearly three times more likely than White males to carry a gun (most often) to school, holding constant for the other student-level variables modeled in Table 5.4.

In contrast to the findings for weapon carrying, results in Table 5.4 reveal no attachment effects. That is, the measures of parental and school attachment are unrelated to a male student's likelihood of taking a gun to school. Consistent with findings in the previous chapter, however, involvement in property crime and drug sales are significantly associated with a student's likelihood of carrying a gun at school, as well as being a witness or victim of acts of weapon violence. Moreover, it is still found that access to a household handgun is meaningfully related to gun possession in school. Specifically, males who reported access to a household handgun were almost three times more likely than males without access to carry a gun to school. Finally, a male student's level of depression or emotional maladjustment is not related to school gun carrying, which is contrary to the findings for weapon carrying.

Each of the school-level variables was also modeled once again while simultaneously adjusting for the effects of all the student-level characteristics (effects not displayed). Consistent with the absence of contextual effects in the sociodemographic models in this chapter, these findings revealed that none of the school-level variables were significantly

associated with mean gun carrying. Consequently, findings here provide no support for the contention that external community conditions significantly affect the level of gun carrying in a school. Instead, analyses undertaken in this chapter reveal that school gun carrying is most associated with male students' existing involvement in problem behaviors.

SUMMARY

Arguments and research were noted in this chapter which suggested that contextual or community effects may be more discernable when the outcome is gun carrying, relative to the broader behavior of weapon carrying. For example, research undertaken by Cook and Ludwig (2004) found that contextual effects, such as the county robbery rate and percent suicides with a firearm, were significant in distinguishing male adolescents who carried a firearm from those who only carried a non-firearm weapon. As noted, acquiring a non-firearm weapon to carry to school for any purpose is likely not difficult regardless of who students associate with or where they reside (e.g., high crime vs. low crime area). In the case of acquiring a firearm, however, students would presumably face greater obstacles in gaining access to a firearm and thus extended networks in one's community are likely more important in securing such a weapon. Moreover, relative to obtaining/carrying a non-firearm weapon, one's motivation to acquire or carry a gun may be more affected by community conditions, for more difficult circumstances, such as residing in high crime or disadvantaged communities, likely undermines the perceived effectiveness of non-firearm weapons (e.g., knife) in securing one's safety.

Multilevel analyses carried out in this chapter examined to what extent imported community conditions affected the level of school gun carrying across the 55 high schools in the sample. Specifically, the primary question addressed was whether students attending

schools in communities with greater economic disadvantage, residential mobility, or violent crime were more likely to carry a gun (most often) to school. Consistent with the findings for weapon carrying, there was no indication in the analyses undertaken in this chapter that between-school variability in gun carrying was statistically related to imported community conditions. Indeed, even in the absence of control variables for sociodemographic differences between schools, the imported community variables exerted no significant effect on the mean level of student gun possession.

A hypothesis proposed in the previous chapter was that contextual measures of a school's ecological environment or social system would have no effect on mean weapon carrying after controlling for imported community conditions. In applying this hypothesis here, findings initially revealed that three measures of a school's social system—student absenteeism, fearful students, and physically fought—were related to student gun carrying. These significant effects, however, were mediated after adjusting for student sociodemographic characteristics. Consequently, there was no need to simultaneously model measures of a school's social system and external community environment, for these variables were either insignificant altogether (e.g., imported disadvantage) or mediated after accounting for student-level attributes (e.g., student absenteeism).

With respect to student-level variables, findings revealed that a few measures proved important in predicting a male student's likelihood of carrying a gun to school. Namely, measures of student involvement in problem behaviors—property crime and sold drugs—were strong determinants of school gun carrying. Additional student-level attributes that were significant in explaining gun carrying were exposure to acts of weapon violence (either as witness or victim) and access to a household handgun.

With a few exceptions, findings presented in this chapter are generally consistent with the findings found in the previous chapter, even though the outcome was school gun carrying among only male students in the sample. Consequently, findings in this chapter provide no evidence of a spillover effect or any confirmation that school gun carrying is more sensitive to external community conditions than weapon carrying in general (i.e., gun or non-gun carrying).

CHAPTER 6

SUMMARY, LIMITATIONS, AND IMPLICATIONS

SUMMARY

In a search of the literature for empirical studies that addressed the interdependence of school violence and neighborhood conditions, Laub and Lauritsen (1998: 140) concluded that:

> *Despite pleas from many researchers who study school violence not to ignore the community context, relatively few empirical studies have systematically examined the relationship between macrolevel community characteristics and crime and violence in schools.*

This research filled a part of this void in the school violence literature by examining the level of interdependence between three measures of a school's attendance area—economic disadvantage, residential mobility, and violent crime—and in-school weapon carrying. More specifically, with a sample of approximately 10,000 students attending 55 high schools throughout the country in 1995, this research identified the distinct effects of community, school, and student-level characteristics on school-based weapon carrying.

This chapter proceeds by summarizing the findings for each of these contextual levels (i.e., community, school, and individual). In discussing these findings, time is taken to address to what extent results found in this study are consistent with findings from prior research. Time is also devoted to elaborating on whether the current findings are supportive of theoretical arguments raised concerning the influence of each of these contextual levels in explaining school-based weapon carrying. For example, are current findings supportive of the argument that the prevalence of in-school violence or weapon carrying is discernibly affected by the surrounding community conditions of a school (i.e., spillover or importation

hypothesis)? Following a summary of the current findings, some limitations of this research are discussed with a particular focus on how future research can better address the limitations of this study. And finally, this chapter concludes by elaborating on the implications of current findings for policy relevant to school-based violence prevention programs.

Community Effects

A number of scholars have underscored the importance of community conditions in shaping violence in and around schools. In particular, many of these arguments are consistent with a spillover or importation view of school violence. That is, the perspective that school violence results primarily from environmental conditions *external* rather than *internal* to schools (see e.g., Reiss and Roth, 1993; Sheley et al., 1992; Sheley et al., 1995). Sheley and Wright (1995: 5) may have best articulated this perspective in stating that "…schools no longer have distinct roles in the etiology of youth violence; rather they have become the physical locations where larger community problems are manifested" (see also Sheley et al., 1992). Menacker and colleagues (1990) reached similar conclusions in their analysis of middle schools located in a high crime area of Chicago. These scholars argued that school violence or problems are the result of inadequacies in the community or family environments in which youths are socialized, and thus schools are not the source of their violence problems.

Welsh and colleagues (2000) made clear a number of ways that community conditions can affect levels of school violence. For instance, the external environment of schools can differentially expose students to violence on their way to and from school. This potential exposure to community violence is likely most pronounced immediately after school, for incident-based data indicates that firearm violence among youths on school days peaks around this time (Snyder and Sickmund, 1999, 2006). Accordingly, students may bring weapons to

school in preparation for confrontational events that occur after they are dismissed from school; of course, returning to socially disorganized or high crime communities likely only intensifies the perceived need to carry a weapon for purposes of self-protection (see e.g., Cook and Ludwig, 2004; Molnar et al., 2004; Patchin et al., 2006).

Despite the noted conceptual arguments that highlight the importance of community conditions in affecting levels of school violence (i.e., spillover hypothesis), findings in this research found no significant relationship between measures of a school's external environment and levels of school weapon carrying. In keeping with a distinction made by Welsh et al. (1999), the three community variables examined in this research measured environmental conditions in the "imported" school community, as opposed to environmental conditions in the "local" school community. Measures of the "imported" school community capture social conditions in a school's attendance or catchment area. Furthermore, the three imported community characteristics examined in this research were economic disadvantage, residential mobility, and violent crime.

Even when modeling these imported community variables absent any controls for differences in student sociodemographic characteristics across schools, each of these measures had *no* significant effect on the level of weapon carrying across sample schools (see Table 4.4). Indeed, in graphically examining the bivariate relationship between the expected level of weapon carrying for sample schools and their levels of imported community conditions, findings revealed a rather weak association between student weapon possession and external characteristics (see Figure 4.2). In fact, none of the imported community variables had a bivariate relationship with the expected mean level of weapon carrying that exceeded .15. Throughout all the multilevel analyses, there was no indication that imported

community conditions significantly affected the level of weapon carrying across the 55 high schools in the study sample.

Additional analyses performed with male students in which school gun carrying was the outcome of interest also revealed no imported community effects. It was noted in the previous chapter that some prior research has suggested that community conditions may be more important in shaping levels of gun carrying rather than other forms of weapon carrying (e.g., Cook and Ludwig, 2004). Here again, however, findings produced in this research do not support the claim that community conditions are more salient when the outcome is gun carrying rather than weapon carrying in general.

Overall, current findings do not offer support for the spillover or importation hypothesis. Of course, the absence of community effects in this research is contrary to some recent studies that have also examined the relationship between external community conditions and in-school violence within a multilevel framework. For example, across 11 middle schools in Philadelphia, Welsh et al. (1999) found that the level of imported community poverty was significantly related to the level of student misconduct (a four-item summated index), while simultaneously accounting for student (e.g., age) and school (e.g., size) characteristics.

Benbenishty and Astor (2005) found that variation in forms of school-based victimization was significantly related to a number of community characteristics (e.g., unemployment) across a representative sample of primary and secondary schools in Israel. Throughout these analyses, however, Benbenishty and Astor found meaningful differences in the contextual variables that explained one type of victimization versus another (e.g., moderate vs. severe victimization). These scholars also found that some contextual variables

proved significant in predicting levels of student victimization across primary schools, but these same contextual variables did not prove significant in explaining levels of student victimization across secondary schools. In light of these varying findings, Benbenishty and Astor (2005: 118) concluded that "…we cannot make sweeping generalizations of how context affects school victimization." In general, however, the findings of Benbenishty and Astor are supportive of the contention that community conditions meaningful affect the level of in-school violence.

The studies of Welsh et al. (1999) and Benbenishty and Astor (2005) are different from the current research in some notable ways. First, the researchers in each of these studies examined a broader-spectrum of school-based behaviors; that is, an index of in-school antisocial or victimization behaviors served as the outcome in these studies. Such broader outcomes presumably allow for greater between-school variability than a single-item measure of weapon carrying; thus making it more likely to find contextual effects. Even if this were not the case, as Benbenishty and Astor (2005) suggested, it is difficult to make broad generalizations when the significance of contextual effects vary across outcomes and samples. Welsh et al. (1999) examined *in-school misconduct* (e.g., had to fight to protect oneself) across 11 *middle schools* in Philadelphia. Benbenishty and Astor (2005) examined *in-school victimization* across 232 *elementary, middle,* and *high schools* in Israeli. Accordingly, it is difficult to assess how much findings in this research deviate from the findings of Welsh et al. (1999) and Benbenishty and Astor (2005) given the clearly different outcomes and samples.

There is certainly some agreement between the general findings of this research and those of Welsh et al. (1999), however. In discussing the implications of their findings, Welsh et al. (1999: 106) stated that "The thesis that 'bad' kids or 'bad' communities directly import

violence into any school is unsupported by our results" (see also Baker et al., 1989; Clark and Lab, 2000). A similar claim could be made with findings from this research as well. That is, the level of school-based weapon and gun carrying across high schools in the current sample was unrelated to imported community conditions external to schools. Consequently, findings here offer no support for the importation or spillover hypothesis.

School Effects

Theories of school climate and the schools-as-communities perspective were used to elaborate on the potential effects schools have on regulating the level of weapon carrying among their students. In particular, the school characteristics examined in this research captured two broad categories of variables: (1) *ecological environment* or *milieu*; and (2) *social system* or *culture*. Five school-level variables were constructed in this research that measured internal characteristics of a school's ecological environment or milieu: *urbancity, orientation* (i.e., private or public), *size, region* (i.e., South), and *racial composition* (i.e., percent Black). Interestingly, none of these five variables proved significant in accounting for levels of school-based weapon and gun carrying across the 55 high schools in the sample.

With respect to school size, findings have been generally mixed regarding the influence of this variable on a variety of academic and nonacademic outcomes (Anderson, 1982; Gottfredson, 2001); thus finding no school size effect in this research is not at odds with a number of studies in the school violence literature (see e.g., Felson et al., 1994; Welsh et al., 1999, 2000). Furthermore, in their of analysis school weapon carrying across middle schools in Kentucky, Wilcox and Clayton (2001) found that the racial composition (i.e., proportion nonwhite) of schools was unrelated to the level of weapon carrying.

What is likely more surprising among the measures of a school's ecological environment is the absence of effects for urbancity and orientation. As mentioned, weapon violence among youths is largely perceived as an inner-city problem, and much research undertaken in the early 1990s tended to embrace this perception by way of examining weapon or gun carrying among youths in urban samples (see e.g., Arria, Wood, and Anthony, 1995; Black and Ricardo, 1994; Sheley and Wright, 1995; Webster et al., 1993; Vaughan et al., 1996). Although many of these studies highlighted the commonness of weapon use among urban adolescents, they were unable to address the pervasiveness of such behaviors among rural and suburban youths.

Interestingly, with a nationally representative sample of adolescent males, Cook and Ludwig (2004) found that, after controlling for a number other relevant variables, males residing in urban areas were *not* more likely than males in rural or suburban areas to report carrying a gun or non-firearm weapon. Furthermore, using area-identified assault and robbery data from the NCVS, Baumer and colleagues (2003) found that victims (aged 12 or older) residing in a "central city" were *no* more likely than victims residing outside a central city to report that their perpetrators possessed a gun or other weapon. These findings suggest that the effect of urbanicity may be less pronounced in more representative samples that capture rural and suburban residents as well, which was the case in this research.

In their study of a nationally representative sample of public and Catholic high schools, Bryk et al. (1993) found a Catholic school effect when examining a number of teacher and student outcomes (e.g., reports of classroom disorder). Lee and Croninger (1996), with a national sample of high school students, found that students attending private schools were less likely to report feeling unsafe at school than their public school counterparts. In the

case of Catholic schools, Bryk et al. (1993) attributed this effect to Catholic schools being more effective in fostering a "communal" environment that served to better regulate the behaviors of their students. Current results found no such private school effect when examining levels of school-based weapon and gun carrying. It is difficult to assess whether this lack of a private school effect is atypical, for most school-based samples are only comprised of public school students. Consequently, more school-based research is needed that involves private schools, and, within the context of this study, address whether private schools are more effective in overcoming the external conditions of the communities they serve. Once again, findings here do not offer support for this claim.

In general, it is likely encouraging for schools to find that measures of their ecological environment and milieu are unrelated to levels of weapon and gun carrying in this research. As mentioned, these conditions are generally beyond the immediate control of schools and thus changing or modifying environmental or milieu characteristics is often not feasible for schools. On the other hand, environmental conditions that are more amenable to change or manipulation on the part of schools are characteristics of their social system or culture.

There were six measures of a school's social system or culture that were examined in this research: *PTA participation*, *student absenteeism*, *student extracurricular involvement*, *social disorder*, *students' fear of school*, and *student involvement in physical fights.* Of these six variables, three were initially associated with the level of weapon *and* gun carrying across the sample high schools: *student absenteeism*, *fearful students*, and *physically fought*. After adjusting for sociodemographic differences, however, only *fearful students* sustained a significant effect in the weapon carrying models, and no school-level variables sustained significance in the gun carrying models. Even the *fearful students* variable was eventually

rendered insignificant in the weapon carrying models after accounting for all the student-level characteristics.

It was previously argued that the school-level variables initially associated with the level of weapon and gun carrying are consistent with arguments surrounding the fear of victimization hypothesis. That is, schools attended by students who commonly express concerns about being in school; regularly interact with students prone to physical confrontations; and have classmates who routinely miss school are more likely to carry a weapon to school. Such conditions likely create an environment of apprehension in schools that increases students' desirability to carry a weapon for protection. As mentioned, the application of the fear of victimization hypothesis has been generally applied or tested at the individual level (e.g., May, 1999; Steinman and Zimmerman, 2003), but preliminary findings in this research suggest this hypothesis is applicable at the contextual level as well. Future research could further advance the fear of victimization hypothesis at the contextual level by incorporating variables that measure fear and avoidance behaviors that directly result from students' perceived risk of in-school victimization.

There was no support for the schools-as-communities perspective in this research. Namely, two variables in this research captured the quality of interaction among school personnel, parents, and students: PTA participation and social disorder. Some recent studies in the school violence literature have found mixed results with measures capturing the school-as-communities perspective and their effects on school-based victimization and delinquency. For example, using a nationally representative sample of 254 secondary schools, Payne et al. (2003) found that schools with a strong communal environment experienced less teacher victimization, but a strong communal environment was not directly associated lower levels of

student delinquency and victimization. Stewart (2003), with a national sample of tenth grade students, found that schools with higher levels of cohesion did not experience significantly lower levels of student misbehavior. Collectively, these results suggest that a stronger communal environment or greater sense of cohesion in schools does not always translate into lower levels of student delinquency or victimization. Similar discrepancies have been found in the neighborhood effects literature; that is, strong interactions or informal networks among neighborhood residents are not consistently associated with lower levels of crime or delinquency (Bursik and Grasmick, 1993; Sampson and Groves, 1989).

Overall, when school effects were found in this research, these significant effects represented measures of a school's social system or culture, as opposed to measures of a school's ecological environment or milieu. In reviewing the school effects literature, Gottfredson (2001: 85) outlined how community and school characteristics come to shape school misbehavior. In her path diagram, measures of a school's social system or culture were considered more proximate determinants of in-school misbehavior than compositional characteristics of schools (i.e., milieu). Findings uncovered in this research generally support this claim with regard to levels of weapon and gun carrying across the 55 high schools in the study sample.

Individual Effects

One of the formal hypotheses proposed in this research was that gender and involvement in problem behaviors would be strong determinants of school weapon carrying. In general, current research findings support this hypothesis. Specifically, males were more than two and one-half times more likely than females to carry a weapon to school, and involvement in problem behaviors such as property crime and drug sales was significantly

associated with school weapon possession. These findings closely parallel results found in the existing literature (see e.g., DuRant et al., 1997; DuRant et al., 1999) and further call into doubt "the image of otherwise law-abiding youths carrying guns solely for protection" (Webster et al., 1993: 1607).

It was noted that among high school samples age or grade effects have not been regularly identified (see e.g., Coggeshall and Kingery, 1999; Simon et al., 1997; Simon et al., 1999), and findings in this research also found no relationship between age and in-school weapon and gun carrying. Furthermore, current findings revealed no significant association between race/ethnicity and weapon carrying, but this research did find that among males Black students were nearly three times more likely than White students to carry a gun to school, net of other predictors. Interestingly, Cook and Ludwig (2004) found similar results in their analysis of adolescent males; that is, Black males were more likely than White males to report carrying a gun (anywhere) but were no more likely to report carrying a weapon in general. Similarly, DuRant et al. (1999) found that minority students were more prone than White students to carry a gun to school but were no more inclined to carry a non-firearm weapon to school. Overall, these results suggest that Black or minority students are no more likely than White students to carry a weapon, but when Black or minority students choose to carry a weapon, they are more inclined than White students to carry a firearm.

Additional student-level variables that proved significant in predicting weapon carrying included one's attachment to parents and school. As noted, the effect of family or parental effects on school weapon possession has been mixed in the extant research, but when such effects have been discovered, it has been indicators of family structure that have proven most relevant. In this research, however, family or household structure was unrelated to

weapon possession, while parental attachment was inversely associated with school weapon carrying. This finding is more in line with the broader violence research which indicates that the quality of family relationships is a stronger predictor of adolescent delinquency than family structure (Laub and Sampson, 1988; Rankin and Kern, 1994).

With respect to school social bonds, findings here are consistent with some prior research that has found a significant association between school attachment/connectedness and in-school weapon possession (Kodjo et al., 2003; Wilcox and Clayton, 2001). Interestingly, prior out-of-school suspension(s) and unexcused absence(s) were not significantly associated with school-based weapon and gun carrying. Furthermore, school performance (i.e., GPA) was unrelated to in-school weapon and gun possession, which is consistent with some prior research (Bailey et al., 1997; DuRant et al., 1997). In general, therefore, current findings indicate that a student's perceived attachment to school (via pro-social relationships with classmates and staff) is a stronger determinant of weapon carrying than school performance, attendance, or prior school reprimands. Notably, there were no parental or school attachment effects found in the gun carrying models, however.

Finally, the two measures of fear explored in this research—school and neighborhood fear—were unrelated to weapon and gun carrying. As addressed, however, these two measures represent cognitive measures of "formless" or "global" fear (see Garofalo, 1979), which are generally poorer indicators of fear than behavioral modification variables (e.g., avoiding certain places in school; Warr, 2000). On the other hand, it was found in this research that exposure to weapon violence as a victim or witness was a strong predictor of in-school weapon and gun possession, which is generally consistent with prior research (see e.g., DuRant et al., 1996, 1997; Simon et al., 1999). Thus, findings here indicate that actual risk of

victimization is a stronger predictor of school-based weapon carrying than cognitive measures of school or neighborhood fear. Accordingly, there was no support for the fear of victimization hypothesis in this research at the individual level.

LIMITATIONS

There are a number of limitations with this research, but given the focus of this study, the discussion below will concentrate on weaknesses that deal with the school community component of this research. First, this research only examined the *direct* effects of imported community conditions on school-based weapon carrying. Of course, this modeling strategy is consistent with the spillover or importation hypothesis in that external community conditions are expected to have a direct effect on the level of violence in and around schools. Some scholars, however, have articulated that community conditions affect the level of violence in and around schools via their effects on the environmental conditions of schools (see e.g., Gottfredson, 2001). Within this theoretical framework, one would test for both the *direct* and *indirect* effects of community conditions on in-school violence.

Such a test could be untaken using structural equation modeling (SEM) or path analysis wherein the unit of analysis is schools. For example, using such a technique with the current sample, the measures of the imported community conditions (e.g., economic disadvantage) and school characteristics (e.g., social disorder) would be used to explain variation in the mean level of weapon carrying (N = 55). Most importantly, the total influence of community conditions on mean weapon carrying could then be partitioned into direct and indirect effects.

As noted, this research only explored the direct effects of imported community conditions on mean weapon carrying. It may be, however, that external community

conditions, such as economic disadvantage, affect school-based weapon carrying via their effects on measures of the school social system or culture. For instance, this research found in preliminary analyses that student absenteeism was significantly associated with the level of weapon carrying across the sample high schools. The bivariate correlation between student absenteeism and levels of imported disadvantage (.44), residential mobility (.29), and violent crime (.38) were each statistically significant ($p < .05$); thus suggesting that, in part, imported community conditions shape the level of student absenteeism which in turn affects the level of student weapon carrying.

It may also be that imported community conditions affect levels of weapon or gun carrying via their effects on pertinent explanatory variables such as exposure to or involvement in other problem behaviors. Table 6.1 addresses, in part, the potential effects of imported community conditions on other problem behaviors examined in this research (i.e., handgun access, property crime, interpersonal violence, sold drugs, and weapon victimization). Panel A presents results from fully-unconditional models using each of the listed problem behaviors as an outcome. The significant between-school variance component for each of these behaviors indicates that meaningful variation is present across schools with respect to these outcomes. Panel B displays findings that separately model the bivariate effects of imported disadvantage, mobility, and violent crime on each of the five outcomes. Thus, the estimates presented in Panel B are not adjusted for student-level characteristics. The estimates presented in Panel C do adjust for such differences, however.

Overall, the findings presented in Panels B and C indicate that imported community conditions have either modest or mixed effects on the listed outcomes with the exception of weapon victimization. In the case of weapon victimization, each of the imported community

conditions has a significant effect on this outcome even after adjusting for other student-level characteristics (e.g., race and GPA). Of course, exposure to weapon violence either as a victim or witness was a highly significant predictor of whether a student reported carrying a weapon to school. Thus, imported community conditions may affect levels of student weapon carrying via their effects on intervening processes such as exposure to weapon violence. In general, however, the few studies that have systematically examined the effects of community conditions on school violence have only explored the direct effects of such characteristics (although see Welsh et al., 2000). Future research would be beneficial if more efforts were made to empirically explore the total effects of community conditions on violence in and around schools.

Another limitation of this research is that it was unable to account for conditions in the local school community. As mentioned, Welsh and colleagues (1999) made a distinction between the local school community and the imported school community. Because the Add Health data does not formally identify the census tract for which a school is located, this research was only able to account for conditions in the imported school community. Although Welsh and colleagues (1999, 2000) found comparable findings in estimating separate models for the local and imported school communities, future research should continue to recognize the distinction between the local and imported school community and attempt to construct measures that account for each of these contextual environments.

Even the imported community variables explored in this research are subject to some criticism, however. It was noted in the methods chapter that, on average, the 55 high schools in the current sample received students from 25 different census tracts (median is 15 tracts). The imported variables examined in this research aggregated conditions across these census

tracts to create summary measures of economic disadvantage and residential mobility. As a result, variability in these residential conditions *within* schools is washed out with the imported community variables examined in this research. This proves noteworthy, for as Clark and Lab (2000: 40) indicated, "If a school's catchment area draws students from a range of different locations, such as different socioeconomic neighborhoods or ethnic enclaves, this may enhance crime and conflict in the school"; but creating aggregate measures of social conditions in a school's catchment area does not capture this within school variability in residential locations. This argument is likely most applicable with large urban and suburban high schools that receive students from sizeable catchment areas, such high schools were primarily represented in this research.

This issue raises a question as to how "imported" community conditions should be measured or modeled in future research. Welsh et al. (1999: 95) indicated that a three-level model would be "desirable" wherein students (level 1) are nested in schools (level 2) which are nested within communities (level 3). Such a model, however, would presumably extend an analysis beyond the "immediate" or "local" school community, for "communities" in such a three-level model would likely represent cities, counties, or metropolitan areas. Consequently, the community variables in such a three-level model would once more be unable to capture within-school variability in residential areas from which students are drawn.

An alternative modeling or measurement strategy could involve treating imported community conditions as level-1 or student-level characteristics. Such a modeling strategy would have to involve the availability of data for the immediate geographical areas in which students reside, such as census block data. Of course, data collected at some larger geographical unit, such as census tracts, would likely involve the clustering of students. That

is, a situation where numerous students reside in the same census tract and thus social conditions (e.g., economic disadvantage) within these tracts could no longer serve as student-level characteristics.

Let us assume for the moment, however, that census block data is available that captures the environmental conditions of students' immediate residential area. Such environmental conditions could be modeled as student-level characteristics, for the number of students residing in the same census block would likely be limited with larger urbanized high schools. With this measurement or modeling approach, one would have students (level 1) nested within schools (level 2), but the "imported" environmental conditions (e.g., economic disadvantage and residential mobility) would be modeled as level-1 characteristics. In testing the importation or spillover hypothesis with this multilevel model, one would *not* expect to find significant variability in mean weapon carrying across high schools (level 2) after adjusting for differences in imported community conditions (level 1) from which students are drawn. Of course, the benefit of modeling community conditions at level 1 is that within-school variability in student residential locations can be captured. Unfortunately, most school-based studies do not collect community data in a fashion that would allow for such an analysis. Even conceptually, however, there is a greater need for discussion in the literature as to how "imported" community conditions should be modeled when examining school-based outcomes such as in-school weapon carrying.

The final limitation of this research that is discussed pertains to possible variables not accounted for in this study. During the 1999 to 2000 school year, roughly 3 percent of public high schools required their students to pass through metal detectors daily, and nearly 15 percent of public high schools reported conducting "random checks" on students with mobile

metal detectors (DeVoe et al., 2005). An important issue to understand within the context of this research then is whether the use of these security measures are differentially employed based on community or school characteristics. Available descriptive data from the 1999 to 2000 school year seems to suggest that the use of metal detectors, as well as other security measures (e.g., random sweeps for contraband), in schools does vary by community and school characteristics. For example, among public schools (i.e., primary, middle, and secondary) where less than 10 percent of their students were minority, *zero percent* of these schools required their students to pass through metal detectors on a daily basis. Among public schools in which 75 percent or more of their students were minority, however, roughly *four percent* of these schools required their students to pass through metal detectors. A similar disparity was found for random checks with metal detectors as well (DeVoe et al., 2005).

These findings suggest that schools in which weapon carrying or social conditions (e.g., level of poverty) are most problematic are also more likely to use metal detectors and other security measures to prevent weapon and gun carrying among their students. Consequently, the null effects found for imported disadvantage, residential mobility, and violent crime in this research may be attributable, in part, to high schools in more disadvantaged, mobile, and violent communities using security measures to suppress weapon carrying among their students. Although the effectiveness of security measures in schools is seldom examined or documented (DeVoe et al., 2005), future research would be beneficial if efforts were made to incorporate control variables that accounted for the use of security measures in schools, especially metal detectors, when examining community effects on school-based weapon carrying.

Overall, future research would improve or extend the existing literature by addressing a number of limitations of this research. First, more research is needed that systematically examines the *total* effects of community conditions on violence in and around schools. As mentioned, some scholars have articulated that external community conditions affect school-based violence via their influence on social and cultural processes in schools (see e.g., Gottfredson, 2001; Welsh et al., 2000).

Second, future research should continue to recognize the distinction made by Welsh and colleagues (1999) regarding the "local" and "imported" school community. In general, empirically modeling the effect of the local school community (i.e., area immediately surrounding a school) on school-based violence seems less ambiguous than determining how one should ideally model the effect of the imported school community on delinquency in and around schools. This is due in large part to the recognition that large urban and suburban schools draw students from different residential locations (see e.g., Clark and Lab, 2000), and this within-school variability in residential environments is not best accounted for by creating a single summary measure of the imported school community. To this end, more discussion is needed concerning the mechanisms or processes that allow communities to shape in-school violence, and, more precisely, whether these processes or mechanisms unfold differently in the local versus imported school community.

Finally, future research should attempt to address whether schools in socially disorganized or high crime communities employ more security measures, especially metal detectors, in effort to reduce the level of weapon carrying among their students. Otherwise, one cannot rule out the possibility that community effects are not regularly discerned in school weapon carrying studies because schools in socially disorganized or high crime

communities take more precautions to suppress levels of weapon carrying. Accordingly, the use of control variables to account for the differential use of devices such as metal detectors is certainly needed in order to better isolate the strength of the relationship between community conditions and in-school weapon and gun carrying.

IMPLICATIONS

The implications of this research are discussed with a particular focus on how findings here could shape school-based initiatives intended to reduce weapon carrying among students. Following a similar pattern employed throughout this research, this discussion will concentrate on each of the three contexts examined in this research: community, school, and individual.

Community Implications

As mentioned on several occasions throughout this research, there was no support in this study for the spillover or importation hypothesis, and the equivalent argument that external community conditions discernibly affect the level of weapon and gun carrying in schools. This finding is contrary to the arguments of Sheley and Wright (1995), as well as others (see e.g., McDermott, 1983; Menacker et al., 1990), that no prevention effort will have a discernable and sustained effect on school violence absent structural and cultural changes in the larger community. As indicated by Laub and Lauritsen (1998: 143), however, Sheley and colleagues came to this policy conclusion based on research that did not "directly measure community-level factors."

Overall, findings in this research would not provide justification for the allocation of resources intended to modify or change school community conditions in order to reduce student weapon carrying in and around schools. Notably, this policy conclusion must be

considered in light of the limitations of this research. In general, however, this policy implication is consistent with the underlying assumption of most violence prevention programs implemented in schools; that is, that school violence results from deficiencies in the student or school and *not* deficiencies in the larger school community (see e.g., Astor and Meyer, 2001; Gottfreson et al., 2002). Lab and Clark (2000: 39) may have best summarized the implications of findings here in commenting on their own research:

> *At first glance, these results might appear disappointing, though they actually portend positive results for schools. Instead of showing that schools are at the mercy of their immediate environments, the results actually suggest that schools can effectively insulate themselves and their students from the problems in their neighborhoods.*

School Implications

As discussed, in outlining how community and school factors come to influence student problem behaviors, Gottfredson (2001) indicated that social system or culture variables are more proximate predictors of school misbehavior than compositional or ecological characteristics of schools. Findings here generally support this claim, for when school effects were identified, it was measures of the school social system or culture that proved significant in predicting levels of school-based weapon and gun carrying. Specifically, current findings revealed that levels of student absenteeism, fearful students, and students who physically fought were each initially associated with school weapon possession.

Welsh and colleagues (2000) indicated that systematic analyses of the relationship between school-level attendance rates and school disorder or violence are sparse. These researchers found, however, that the level of school stability (i.e., attendance rates and student turnover) across 40 middle schools in Philadelphia was significantly associated with school

disorder. In fact, Welsh et al. (2000) found that school stability strongly mediated the effect of external community conditions (e.g., poverty and stability) on school disorder. These scholars suggested that school stability or attendance rates partially reflect disciplinary policies—through resources devoted to regulating truancy—and students' belief in conventional rules (p. 250).

Assuming for the moment that these are the processes that attendance rates indirectly capture, Gottfredson (2001: 261) noted that school interventions aimed at setting clearer rules and expectations for student behavior, as well as aimed at consistently enforcing these rules, have shown signs of promise in reducing levels of student misconduct. When it comes to weapon carrying, however, there was no ambiguity across the high schools in this study in how they handled students found possessing a weapon in their halls: that is, they were immediately expelled or suspended. Not surprisingly, therefore, a zero tolerance policy was enforced by each of the high schools examined in this study, and so it stands to reason that most students in these high schools, or in most any high school for that matter, understood that being caught with a weapon at school brings about serious consequences.

As a result, setting "clearer" rules concerning this behavior is likely to have little effect on levels of weapon carrying among students, for unlike other problem behaviors undertaken in school (e.g., smoking, drinking, and fighting), there seems to be little ambiguity about how to handle weapon carrying across schools. In general, this research, as well as the research of Welsh et al. (2000), seems to suggest that improving student attendance levels would in turn lower levels of school weapon carrying and general disorder. The precise processes at work, however, remain unclear.

With respect to levels of student fear, findings in this research indicate that alleviating general fear associated with attending school may lower levels of student weapon carrying. Felson et al. (1994), with a national sample of 87 public high schools, found that favorable attitudes towards violence among male students were significantly associated with higher levels of delinquency across schools. Although student fear and favorable attitudes towards violence hardly go hand-in-hand, they do represent undesirable aspects of a student culture. That is, high levels of fear and pro-delinquent attitudes likely create a student culture favorable to such behaviors as weapon carrying. Moreover, the bivariate association between *student fear* and the contextual variable *physically fought* was .53 ($p < .05$) in this research. Not surprisingly, therefore, this association suggests that fear, involvement in delinquent activities, and, from the work of Felson et al. (1994), pro-delinquent attitudes are closely related at the school level. Gottfredson (2001) classified such school-level characteristics as indicators of the "dominant peer culture."

In general, findings here provide some basic support for school interventions intended to change or modify student cultures defined by such elements as high levels of fear. As noted, however, there were no school-level characteristics—including student fear—that sustained significance after accounting for students' own involvement in other problem behaviors (e.g., property crime). Furthermore, Gottfredson (2001: 262) noted that "…interventions to increase social control through an extended network of caring adults who interact regularly with the students…" to foster a communal environment have shown promise in reducing levels of school violence and disorder. Interestingly, measures capturing the schools-as-communities perspective (i.e., social disorder and PTA participation) were unrelated to levels of weapon and gun carrying throughout this research. Consequently, there

is no support in this research for the contention that stronger communal environments in schools would discernibly lower levels of weapon and gun carrying.

Individual Implications

Consistent with some research (e.g., Wilcox and Clayton, 2001), this study found that the primary determinants of school-based weapon carrying were student-level characteristics; in particular, gender and involvement in other problem behaviors. In most instances, student-level prevention or intervention programs found in schools are not administered to select students. That is, all students generally within a specified grade range are eligible to participate in violence prevention programs. Findings here, however, indicate that in the case of reducing weapon carrying there may be some benefit to administering prevention programs to select students. Specifically, research time and again has found that male students are generally more than three times more likely than female students to carry a weapon to school. Given this consistent finding, it intuitively makes sense that the prevention of in-school weapon carrying may be most effective if student-level programs were selectively administered to males. Of course, the practicality of such male-specific programs would certainly be questioned given that male and female students are commingled throughout classrooms, and school personnel, parents, and even students may question why females students are not equally deserving of potentially beneficial programs.

Findings in this research also replicated results from other studies in finding that Black adolescents are no more likely than White adolescents to carry a weapon in general, but there seems to be an indication that Black adolescents are more likely than White adolescents to carry a firearm (see e.g., Cook and Ludwig, 2004; DuRant et al., 1999). Accordingly, prevention programs intended to reduce weapon carrying in schools may prove more effective

in specifically discussing firearm carrying in heavily minority schools and non-firearm carrying in predominantly White schools.

The primary determinants of weapon and gun carrying in this research, however, were involvement in other problem behaviors and general exposure to weapon violence as a victim or witness. The variable measuring exposure to weapon violence in this research was not limited specifically to such violence in and around school. Clearly, though, it is beneficial to shelter adolescents from weapon violence irrespective of its potential effect on future involvement in problem behaviors such as weapon carrying.

Regarding involvement in problem behaviors, this research cannot rule out the possibility that weapon carrying is merely an extension of a wider pattern of delinquency. As argued by Gottfredson and Hirschi (1990), delinquent-prone individuals seldom specialize in committing specific types of offenses (e.g., robberies), and findings here indicate that weapon carriers were involved in other forms of delinquency. One implication of this finding is that prevention or intervention programs administered in schools should address a wider involvement in antisocial behaviors, as opposed to targeting participation in specific types of problems behaviors (e.g., alcohol or drug use). As Gottfredson (2001) noted, some of the more promising "individual-change interventions" attempt to develop social competency skills that help students weigh the potential consequences of their involvement in a variety of problem behaviors.

It is commonplace to find studies conclude with something along the lines of "more research is needed", and this study will be no exception. In the case of the interplay between community conditions and violence in and around schools, there has been little empirical research undertaken that has systematically examined this issue, despite its clear relevance

concerning the prevention of youth violence. There remains much to be said both empirically and conceptually about the effects of communities on school violence, and the subsequent underlying assumptions of "comprehensive" violence prevention programs. Findings uncovered in this research call into question the assumption or argument that school violence is largely shaped by conditions in the larger community, and findings here also call into question the assertion that comprehensive programs are vastly superior to those that only address student deficiencies (e.g., low self-control). Once again, however, future research would prove greatly beneficial if such issues could be further explored while concurrently addressing some of the limitations of this study.

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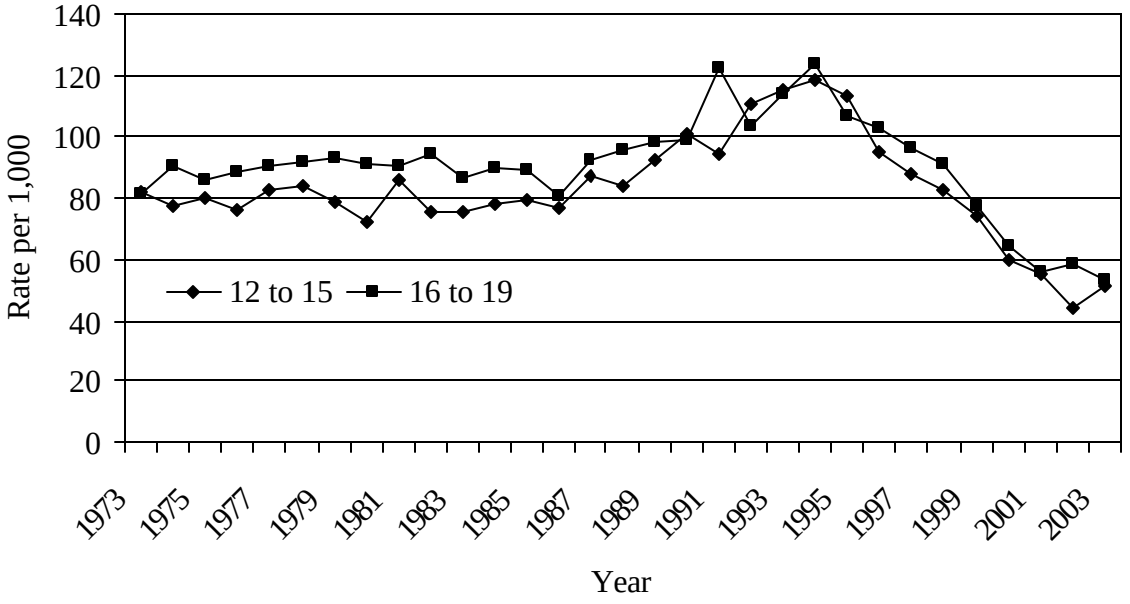
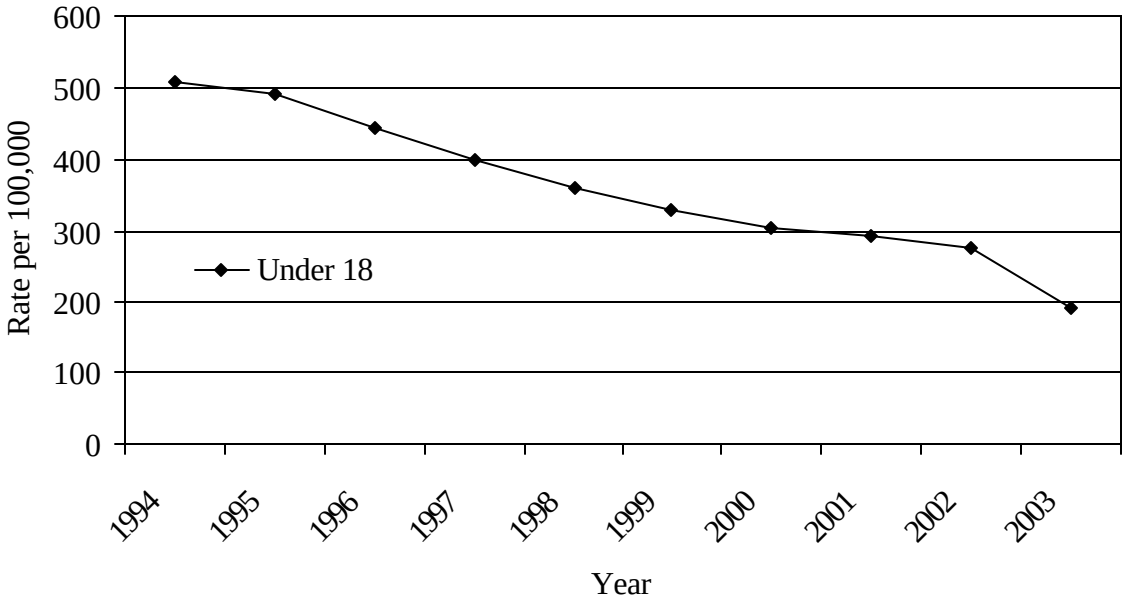
TABLES, FIGURES, AND APPENDIX

Figure 1.1: Violent Victimization Rate per 1,000 Population from 1973 to 2003



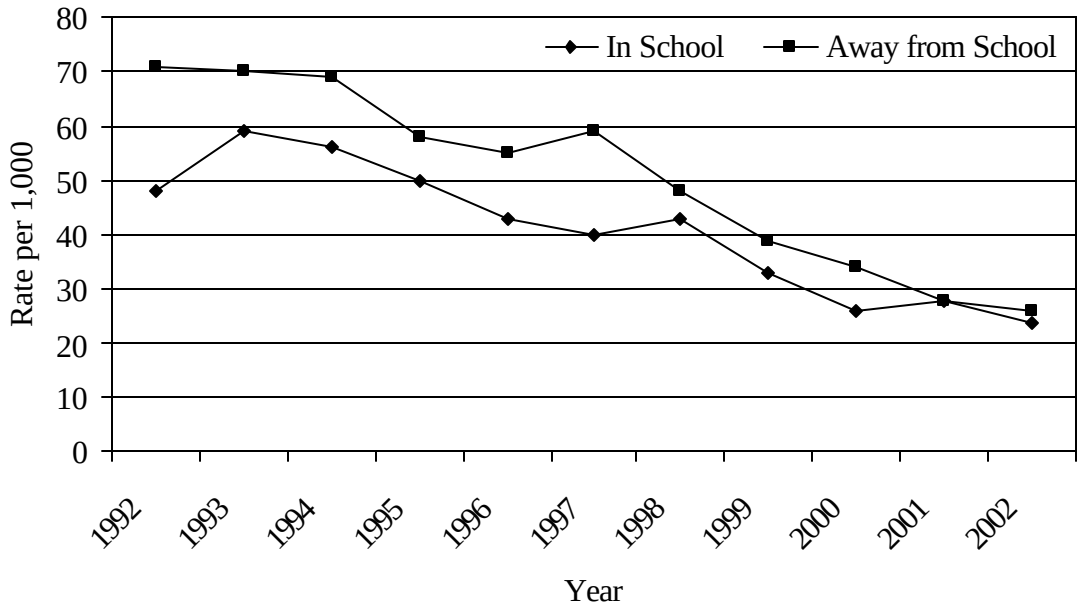
NOTE: Violent crimes include homicide, rape, robbery, and simple and aggravated assaults.
SOURCES: Rape, robbery, and assault data are from the National Crime Victimization Survey. Homicide data come from the Supplementary Homicide Reports. These rates were adapted from the Bureau of Justice Statistics, "Trends in Violent Victimization by Age, 1973-2003."

Figure 1.2: Serious Violent Arrest Rate per 100,000 Population from 1994 to 2003



NOTE: Serious violent crimes include homicide, rape, robbery, and aggravated assault.
SOURCE: FBI Uniform Crime Reports.

Figure 1.3: Nonfatal Violent Victimization Rate per 1,000 Students from 1992 to 2002



NOTE: Violent crimes include rape, sexual assault, robbery, and simple and aggravated assaults.
SOURCE: National Crime Victimization Survey, adapted from DeVoe et al. (2004), *Indicators of School Crime and Safety: 2004* (Table 2.2: 65-68 and Table 2.4: 73-76).

Table 1.1: Homicides of Youths Aged 5 to 19 that Occurred at School and Away from School

Year	At School[a]	Away from School[b]
1992-93	34	3,583
1993-94	29	3,806
1994-95	28	3,546
1995-96	32	3,303
1996-97	28	2,950
1997-98	34	2,728
1998-99	33	2,366
1999-00	14	2,126
2000-01	12	2,047
2001-02	17	2,036

a. "At school" includes on school property, on the way to or from school, and while attending or traveling to or from a school sponsored event.
b. Homicides "away from school" correspond to the calendar year; thus homicides listed in 1992-1993 represent the number of homicides in 1992.
SOURCE: Adapted from DeVoe et al. (2005: Table 1.1, p. 70).

Table 1.2: School Homicides, School Weapon Carrying, and School Weapon Victimization

Year	Homicides[a]	% Carry[b]	% Weapon Victim[c]
1993	29	11.8	7.3
1995	32	9.8	8.4
1997	34	8.5	7.4
1999	14	6.9	7.7
2001	17	6.4	8.9
2003	14	6.1	9.2

a. The number of homicides of youths aged 5 to 19 that occurred at school. "At school" includes on school property, on the way to or from school, and while attending or traveling to or from a school sponsored event. In addition, year in this case represents the school calendar year. For example, 1993 represents the 1993-1994 school year.
b. Percentage of high school students who reported carrying a weapon such as a gun, knife, or club on school property on one or more of the past 30 days.
c. Percentage of high school students who reported being threatened or injured with a weapon on school property one or more times during the past 12 months.
SOURCES: Centers for Disease Control and Prevention, Youth Risk Behavior Surveillance System. School homicides of youth aged 5 to 19 was adapted from DeVoe et al. (2004: Table 1.1, p. 60).

Table 3.1: Descriptive Statistics for High Schools in the Full and Study Samples

Variable	Full N = 80	Study N = 55
Mean # of students per grade	156	233
Private school	19.8%	7.4%
Urban school	23.3%	17.1%
Suburban school	47.0%	69.2%
Percentage Black	16.4%	23.6%
Southern school	36.8%	47.4%

SOURCES: School information from the Carolina Population Center and student responses from the 1994-1995 in-school survey.

Table 3.2: Descriptive Statistics for Students in the Full and Study Samples

Variable	Full N = 11,809	Study N = 10,308
Male	50.9%	50.7%
African American	16.2%	16.1%
Two-Parent household	52.2%	53.7%
Sold drugs last year	9.9%	9.2%
Carry weapon to school	5.9%	5.8%

SOURCE: 1995 in-home interview

Table 3.3: Descriptive Statistics for the Student-Level Dependent and Independent Variables (N = 10,308)

Variables	Mean	Range	# Items	Rel.[a]	Description
Dependent					
Carried weapon	.06	0-1	1		1=Carried weapon to school & 0=did not carry
Student-level					
Male	.51	0-1	1	+	1=male & 0=female
Age	16.5	13-21	1		Continuous variable
Non-Hispanic White	.65	0-1	1		1=Non-Hispanic White & 0=all others
Non-Hispanic Black	.16	0-1	1		1=Non-Hispanic Black & 0=all others
Non-Hispanic Other	.08	0-1	1		1=Non-Hispanic other & 0=all others
Hispanic	.11	0-1	1		1=Hispanic/Latino & 0=all others
Parent education	2.8	1-4	1		1=no high school diploma to 4=university graduate
Single-parent household	.46	0-1	1	+	1=single-parent hh & 0=two-parent hh
Parental attachment	22.3	5-25	5	–	Summated scale; higher scores=greater attachment
GPA	2.7	1-4	4	–	Average grades: English, math, science, soc. studies
School suspension	.30	0-1	1	+	1=ever suspended & 0=not ever suspended
Unexcused absence	.36	0-1	1	+	1=unexcused absence in prior year & 0=no absence
School attachment	22.8	6-30	6	–	Summated scale; higher scores=greater attachment
School fear	3.7	1-5	1	+	1=strongly agree safe in school 5=strongly disagree
Neighborhood fear	.11	0-1	1	+	1=don't feel safe in neighborhood & 0=do feel safe
Weapon victimization	.21	0-1	4	+	1=experienced/saw at least 1 of 4 weapon crimes
Property crime	.17	0-1	3	+	1=committed at least 1 of 3 property crimes
Interpersonal violence	.66	0-4	3	+	Summated scale; higher scores=greater involvement
Sold drugs	.09	0-1	1	+	1=sold drugs last year & 0=did not sell drugs
Peer drug use	3.4	0-9	3	+	Summated scale; higher scores=greater peer drug use
Depression	4.7	0-27	9	+	Summated scale; higher scores=greater depression
Household handgun	.15	0-1	1	+	1=handgun easily accessible in home & 0=otherwise

SOURCE: 1995 in-home interview.

a. Hypothesized directional relationship (+/-) with outcome. In some cases, no directional relationship is proposed (e.g., age).

Table 3.4: Descriptive Statistics for the School-Level Independent Variables (N = 55)

Variables	Mean	Range	# Items	Rel.[a]	Description
School-level					
Percentage Black [b]	2.49	1-4	1	+	1= <2% to 4= >29% (quartiles)
Urban school [c]	.17	0-1	1	+	1=urban school & 0=suburban, rural
Private school [c]	.07	0-1	1	–	1=private school & 0=public school
School size [c]	233	66-887	1	+	Average number of students per grade
Southern school [c]	.45	0-1	1	+	1=school in south & 0=all other regions
PTA participation (*log*) [d]	2.3	0-4.1	1	–	Higher scores=greater parent participation in PTA
Student absenteeism [d]	.15	0-1	1	+	1=daily attendance < 90% & 0=90% or above
Extracurricular inactivity [d]	.16	.01-.31	1	+	Proportion students *not* involved in extracurriculars
Social disorder [b]	5.59	4.1-6.9	4	+	Summated scale; higher scores=greater disorder
Fearful students [b]	.13	.03-.38	1	+	Proportion agree/strongly agree fearful at school
Physically fought [b]	.44	.31-.65	1	+	Proportion students in physical fight last year
Imported disadvantage (*log*) [e]	4.37	3.6-5.2	6	+	Sum: poverty, female hh, unemployed, black, single
Imported mobility (*log*) [e]	4.01	3.4-4.9	3	+	Sum: renter occupied, foreign born, same house
Imported violent crime (*log*) [f]	6.4	4.7-8.0	1	+	Violent crime rate per 100,000 population

a. Hypothesized directional relationship (+/-) with outcome.
b. From the 1994-1995 adolescent in-school survey.
c. From school information made available by the Carolina Population Center.
d. From the 1994-1995 school administrator questionnaire.
e. From 1990 census data.
f. From 1993 Uniform Crime Report data.

Table 4.1: Weighted Zero-Order Correlation Matrix for Student-Level Variables (N = 10,308)

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. Carried weapon	1.000									
2. Male	0.140	1.000								
3. Age	0.014	0.074	1.000							
4. Non-Hispanic White	-0.026	0.022	-0.051	1.000						
5. Non-Hispanic Black	0.014	-0.021	0.035	-0.596	1.000					
6. Non-Hispanic Other	0.011	-0.017	-0.007	-0.390	-0.126	1.000				
7. Hispanic	0.014	0.005	0.042	-0.488	-0.157	-0.103	1.000			
8. Parent education	-0.019	0.025	-0.064	0.184	-0.087	0.051	-0.218	1.000		
9. Single-parent household	0.034	-0.022	0.049	-0.144	0.215	-0.038	0.000	-0.179	1.000	
10. Parental attachment	-0.087	0.076	-0.042	0.029	-0.018	-0.020	-0.006	0.058	-0.165	1.000
11. GPA	-0.116	-0.135	-0.037	0.110	-0.122	0.054	-0.069	0.253	-0.182	0.105
12. School suspension	0.153	0.190	0.080	-0.136	0.168	-0.037	0.041	-0.199	0.191	-0.093
13. Unexcused absence	0.099	0.067	0.208	-0.039	-0.009	0.004	0.066	-0.089	0.129	-0.140
14. School attachment	-0.163	0.021	-0.027	0.001	-0.044	0.019	0.033	0.077	-0.114	0.246
15. School fear	0.083	-0.040	-0.005	-0.093	0.062	0.018	0.053	-0.097	0.084	-0.148
16. Neighborhood fear	0.046	-0.041	0.033	-0.152	0.095	0.025	0.098	-0.129	0.072	-0.063
17. Weapon victimization	0.229	0.173	0.054	-0.165	0.133	0.020	0.077	-0.087	0.122	-0.074
18. Property crime	0.171	0.108	-0.044	-0.047	-0.011	0.047	0.044	-0.011	0.044	-0.133
19. Interpersonal violence	0.250	0.232	-0.025	-0.098	0.084	-0.009	0.058	-0.136	0.095	-0.093
20. Sold drugs	0.196	0.117	0.023	0.007	-0.027	-0.007	0.026	-0.016	0.075	-0.105
21. Peer drug use	0.148	0.070	0.137	0.101	-0.080	-0.027	-0.037	-0.053	0.105	-0.130
22. Depression	0.109	-0.157	0.061	-0.110	0.064	0.041	0.057	-0.128	0.120	-0.294
23. Household handgun	0.096	0.108	0.017	0.085	-0.048	-0.019	-0.057	0.017	-0.038	-0.052
	11	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
11. GPA	1.000									
12. School suspension	-0.343	1.000								
13. Unexcused absence	-0.244	0.229	1.000							

Table 4.1: (Continued).

Variable	11	12	13	14	15	16	17	18	19	20
14. School attachment	0.271	-0.244	-0.206	1.000						
15. School fear	0.164	-0.136	-0.093	-0.422	1.000					
16. Neighborhood fear	-0.080	0.080	0.025	-0.100	0.192	1.000				
17. Weapon victimization	-0.197	0.267	0.186	-0.165	0.127	0.108	1.000			
18. Property crime	-0.148	0.178	0.169	-0.157	0.081	0.034	0.210	1.000		
19. Interpersonal violence	-0.251	0.342	0.194	-0.212	0.122	0.044	0.423	0.295	1.000	
20. Sold drugs	-0.143	0.201	0.159	-0.202	0.064	0.009	0.224	0.290	0.267	1.000
21. Peer drug use	-0.238	0.243	0.270	-0.237	0.056	0.004	0.225	0.221	0.277	0.355
22. Depression	-0.174	0.145	0.144	-0.343	0.217	0.153	0.136	0.131	0.139	0.101
23. Household handgun	-0.009	0.022	0.033	-0.077	0.049	-0.005	0.059	0.048	0.086	0.046

	21	22	23
21. Peer drug use	1.000		
22. Depression	0.156	1.000	
23. Household handgun	0.078	0.015	1.000

NOTE: Underlined correlations are *not* significant at the .05 level (two-tailed test).

Table 4.2: Weighted Zero-Order Correlation Matrix for School-Level Variables (N = 55)

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
1. Percentage Black	1.000									
2. Urban school	0.209	1.000								
3. Private school	0.032	0.075	1.000							
4. School size	0.067	**0.268**	-0.069	1.000						
5. Southern school	**0.468**	-0.105	-0.176	-0.057	1.000					
6. PTA participation	-0.114	-0.172	0.030	-0.093	-0.055	1.000				
7. Student absenteeism	**0.476**	**0.346**	-0.120	0.106	-0.040	-0.116	1.000			
8. Extracurricular inactivity	0.197	0.155	**-0.435**	**0.551**	0.029	**-0.276**	**0.392**	1.000		
9. Social disorder	**0.292**	0.123	**-0.392**	0.203	0.060	-0.095	0.265	**0.612**	1.000	
10. Fearful students	**0.581**	**0.389**	-0.261	**0.325**	0.202	-0.125	**0.579**	**0.533**	**0.677**	1.000
11. Physically fought	**0.333**	**0.279**	-0.185	-0.152	-0.031	-0.207	**0.574**	**0.297**	**0.476**	**0.527**
12. Imported disadvantage	**0.724**	0.045	-0.169	-0.236	**0.455**	-0.097	**0.438**	-0.022	0.221	**0.502**
13. Imported mobility	**0.403**	**0.427**	0.161	**0.417**	-0.156	-0.006	**0.287**	0.087	0.217	**0.337**
14. Imported violent crime	**0.463**	0.220	0.080	0.071	0.150	-0.023	**0.378**	-0.023	-0.118	0.215
	11	*12*	*13*	*14*						
11. Physically fought	1.000									
12. Imported disadvantage	**0.519**	1.000								
13. Imported mobility	0.258	**0.274**	1.000							
14. Imported violent crime	**0.276**	**0.497**	**0.389**	1.000						

NOTE: Bold correlations *are* significant at the .05 level (two-tailed test).

Figure 4.1: Distribution of Weapon Carrying Across High Schools (N = 55)

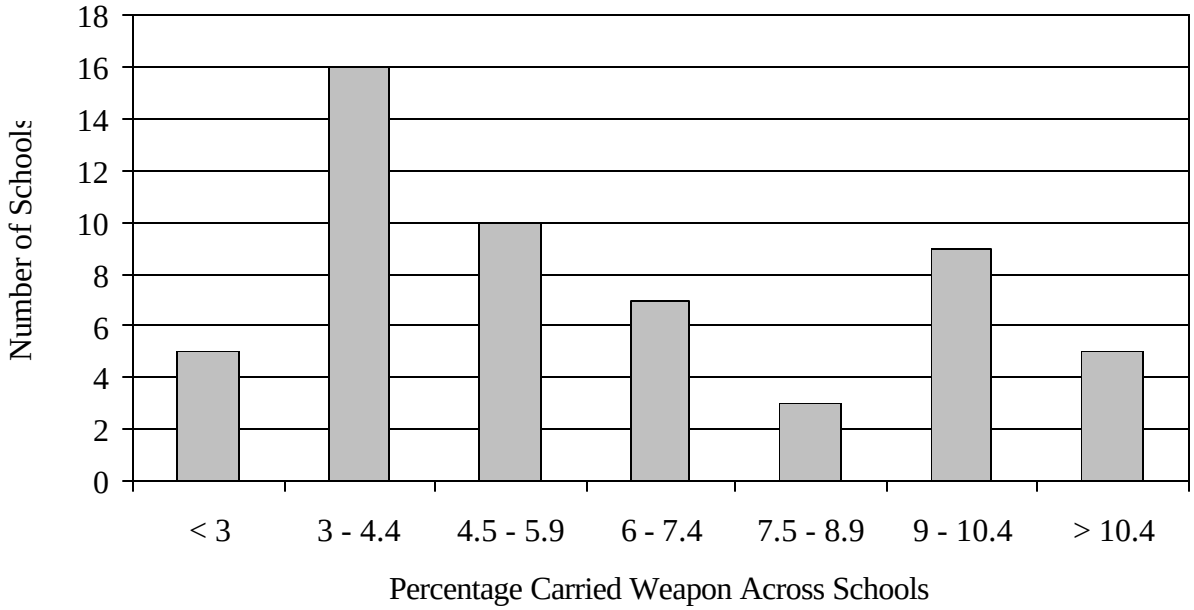


Table 4.3: Unconditional Hierarchical Logistic Model of Weapon Carrying

Fixed Effects

	Coeff.	S.E.	t-Ratio	*p*
Intercept, γ_{00}	-2.78	0.092	-30.127	0.000

Random Effects

	Var.	S.D.	χ^2	*p*
Level 2, u_{0j}	0.202	0.449	150.859	0.000

NOTE 1: PQL unit-specific model with robust standard errors.

NOTE 2: N = 10,308 students (level 1); N = 55 schools (level 2).

Table 4.4: Bivariate Coefficients for Hierarchical Logistic Models of Weapon Carrying

(Model)/ Level-2 Variable	γ_{00}	γ_{01}	*p*	-1s	+1s	Variance
(1) % Black [a]	-2.779	0.113	0.127	0.051	0.067	0.193*
	(0.088)	(0.076)				
(2) Urban school	-2.844	0.356	0.062	0.055	0.077	0.189*
	(0.102)	(0.187)				
(3) Private school	-2.792	0.094	0.679	0.058	0.063	0.207*
	(0.154)	(0.371)				
(4) School size [a]	-2.783	-0.000	0.968	0.058	0.058	0.209*
	(0.076)	(0.000)				
(5) Southern school	-2.890	0.228	0.206	0.053	0.065	0.200*
	(0.143)	(0.178)				
(6) PTA participation [a]	-2.780	0.008	0.102	0.058	0.059	0.208*
	(0.091)	(0.080)				
(7) Student absenteeism	-2.830	0.357	0.033*	0.056	0.078	0.194*
	(0.104)	(0.163)				
(8) Extracurricular inactivity [a]	-2.752	1.611	0.255	0.060	0.060	0.200*
	(0.087)	(1.442)				
(9) Social disorder [a]	-2.768	0.236	0.126	0.052	0.067	0.192*
	(0.088)	(0.152)				
(10) Fearful Students [a]	-2.747	2.970	0.006*	0.049	0.073	0.168*
	(0.080)	(1.036)				
(11) Physically fought [a]	-2.804	2.447	0.051*	0.050	0.066	0.184*
	(0.091)	(1.230)				
(12) Imported disadvantage [a]	-2.792	0.121	0.431	0.055	0.061	0.207*
	(0.096)	(0.153)				
(13) Imported mobility [a]	-2.757	0.030	0.288	0.058	0.061	0.202*
	(0.090)	(0.282)				
(14) Imported violent crime [a]	-2.776	0.094	0.511	0.055	0.063	0.204*
	(0.091)	(0.142)				

NOTE 1: PQL unit-specific models with robust standard errors in parentheses.

NOTE 2: N = 10,308 students (level 1); N = 55 schools (level 2).

a. Level-2 variable grand-mean centered.

* $p = .05$

Figure 4.2: Expected Mean Weapon Carrying by Level of Imported Community Conditions

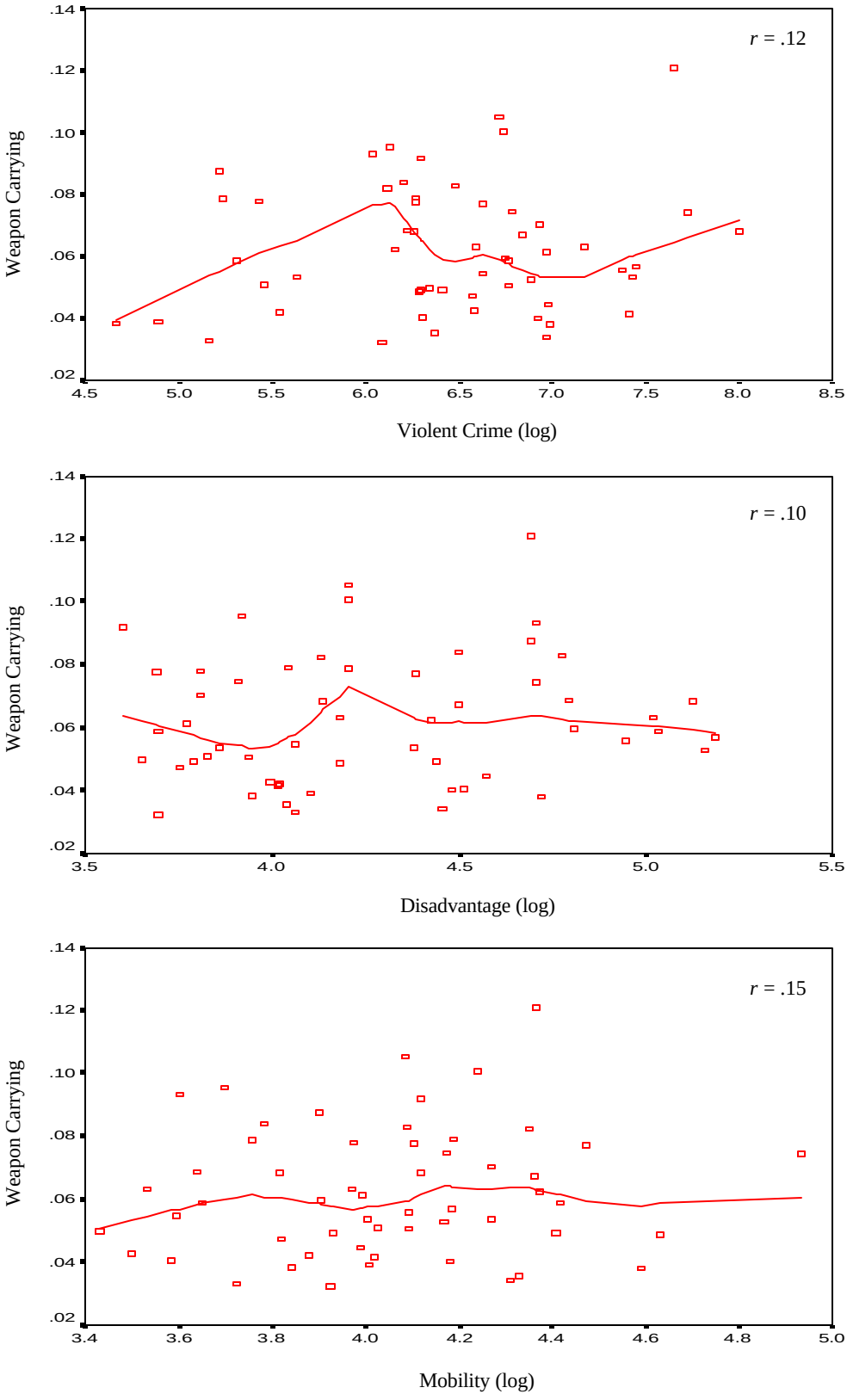
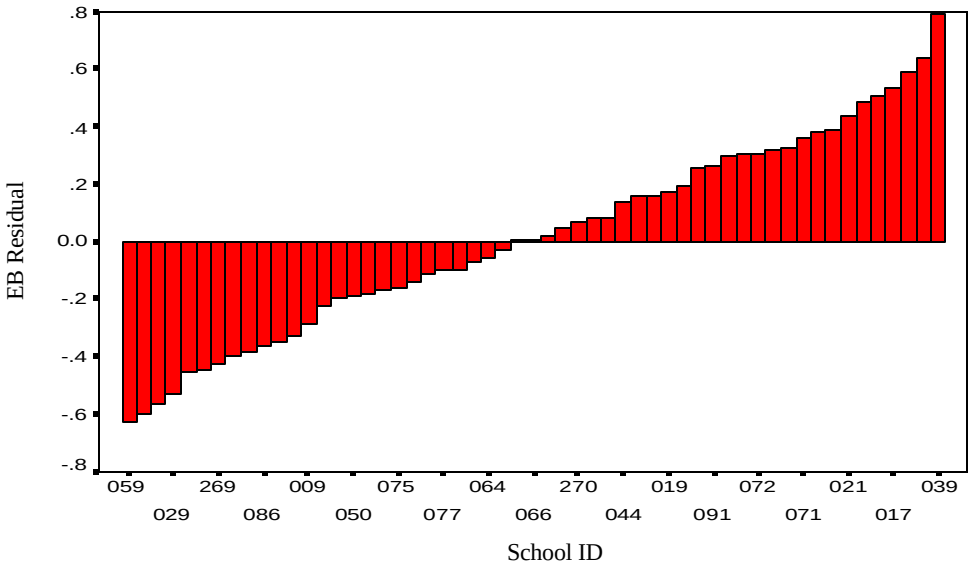


Table 4.5: Expected Mean Weapon Carrying for Imported Community Categories

	Violent Crime	Disadvantage	Mobility
less than -1s	.049	.058	.050
-1 to +1 s	.059	.058	.060
greater than +1 s	.071	.060	.074

Figure 4.3: Empirical Bayes Residuals for Unconditional and Sociodemographic Models



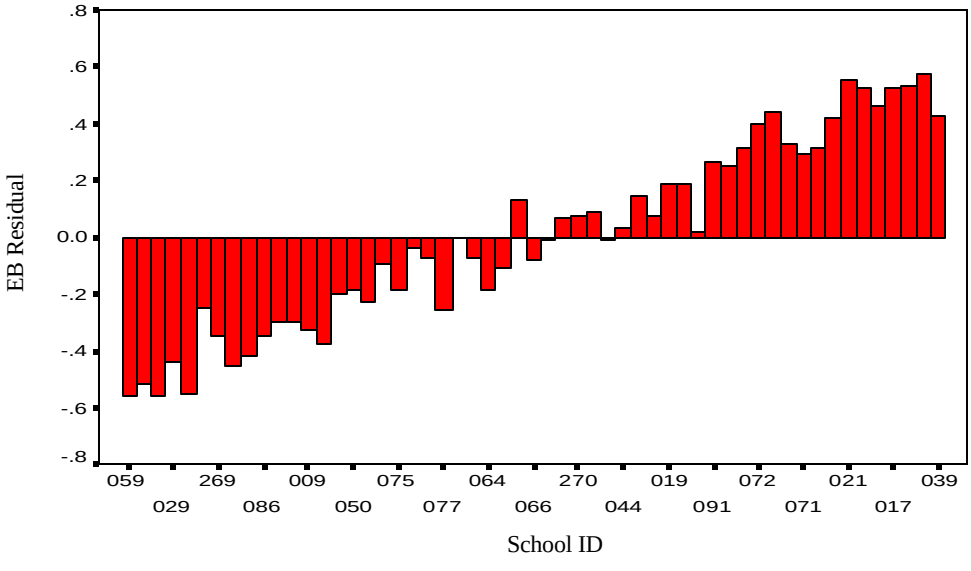


Table 4.6: Hierarchical Logistic Regression Models with Sociodemographic Characteristics

PANEL A

Fixed Effects

Level-1 Variables	*Coeff.*	*S.E.*	*Odds Ratio*	
Intercept, γ_{00}	-2.930	0.100	0.053	*
Male	1.269	0.163	3.556	*
Age	-0.022	0.077	0.978	
Non-Hispanic Black	0.046	0.172	1.049	
Non-Hispanic Other	0.261	0.200	1.298	
Hispanic	0.184	0.212	1.202	
Parent education	-0.102	0.052	0.903	*
Single-parent household	0.164	0.169	1.178	
Random Effects	*Variance*	*S.D.*	χ^2	
Level 2, u_{0j}	0.188	0.433	137.584	*

PANEL B

Fixed Effects

(Model)/Level-2 Variable	*Coeff.*	*S.E.*	*Odds Ratio*		Variance	
(1) % Black	0.117	0.088	1.124		0.180	*
(2) Urban school [a]	0.267	0.173	1.306		0.183	*
(3) Private school [a]	0.146	0.368	1.157		0.192	*
(4) School size	-0.000	0.000	1.000		0.193	*
(5) Southern school [a]	0.259	0.189	1.296		0.181	*
(6) PTA participation	0.019	0.082	1.019		0.193	*
(7) Student absenteeism [a]	0.249	0.156	1.283		0.189	*
(8) Extracurricular inactivity	1.057	1.447	2.878		0.191	*
(9) Social disorder	0.192	0.159	1.212		0.183	*
(10) Fearful Students	2.537	1.072	12.642	*	0.166	*
(11) Physically fought	1.466	1.256	4.332		0.186	*
(12) Imported disadvantage	0.068	0.182	1.070		0.193	*
(13) Imported mobility	0.177	0.303	1.194		0.193	*
(14) Imported violent crime	0.038	0.153	1.039		0.194	*

NOTE 1: PQL unit-specific models with robust standard errors.

NOTE 2: N = 10,308 students (level 1); N = 55 schools (level 2).

a. Level-2 variable *not* centered.

* $p = .05$

Table 4.7: Hierarchical Logistic Regression Models of Weapon Carrying with Fully Specified Level-1 Model

PANEL A

Fixed Effects Level-1 Variables	*Coeff.*	*S.E.*	*Odds Ratio*	
Intercept, γ_{00}	-3.494	0.136	0.030	*
Male	0.949	0.187	2.584	*
Age	-0.079	0.107	0.924	
Non-Hispanic Black	-0.017	0.201	0.983	
Non-Hispanic Other	0.330	0.208	1.391	
Hispanic	-0.037	0.212	0.963	
Parent education	0.018	0.058	1.019	
Single-parent household	-0.212	0.177	0.809	
Parental attachment	-0.047	0.024	0.954	*
GPA	-0.066	0.112	0.936	
School suspension	0.181	0.184	1.199	
Unexcused absence	0.133	0.128	1.143	
School attachment	-0.057	0.015	0.945	*
School fear	0.018	0.053	1.018	
Neighborhood fear	0.112	0.176	1.119	
Weapon victimization	0.729	0.168	2.073	*
Property crime	0.312	0.150	1.366	*
Interpersonal violence	0.395	0.061	1.485	*
Sold drugs	0.644	0.161	1.904	*
Peer drug use	0.045	0.027	1.046	
Depression	0.048	0.016	1.050	*
Household handgun	0.587	0.143	1.799	*
Random Effects	*Variance*	*S.D.*	c^2	
Level 2, u_{0j}	0.217	0.465	141.700	*

Table 4.7: (Continued).

PANEL B

Fixed Effects

(Model)/Level-2 Variable	*Coeff.*	*S.E.*	*Odds Ratio*	Variance	
(1) % Black	0.082	0.113	1.086	0.219	*
(2) Urban school [a]	0.224	0.227	1.251	0.218	*
(3) Private school [a]	0.240	0.324	1.272	0.218	*
(4) School size	-0.000	0.001	0.999	0.222	*
(5) Southern school [a]	0.420	0.216	1.522	0.187	*
(6) PTA participation	-0.014	0.082	0.986	0.224	*
(7) Student absenteeism [a]	0.119	0.218	1.127	0.224	*
(8) Extracurricular inactivity	0.129	1.741	1.137	0.224	*
(9) Social disorder	-0.013	0.184	0.987	0.224	*
(10) Fearful Students	1.715	1.262	5.557	0.213	*
(11) Physically fought	-0.450	1.523	0.637	0.224	*
(12) Imported disadvantage	-0.031	0.222	0.969	0.222	*
(13) Imported mobility	-0.139	0.353	0.870	0.221	*
(14) Imported violent crime	-0.029	0.159	0.971	0.224	*

NOTE 1: PQL unit-specific models with robust standard errors.

NOTE 2: N = 10,308 students (level 1); N = 55 schools (level 2).

a. Level-2 variable *not* centered.

* $p = .05$

Table 5.1: Unconditional Hierarchical Logistic Model of Gun Carrying

Fixed Effects

	Coeff.	S.E.	t-Ratio	*p*
Intercept, ?$_{00}$	-3.991	0.153	-26.139	0.000

Random Effects

	Var.	S.D.	c^2	*p*
Level 2, u_{0j}	0.429	0.655	110.699	0.000
Level 1, r_{ij}	0.681	0.825		

NOTE 1: PQL unit-specific model with robust standard errors.
NOTE 2: N = 5,129 male students (level 1); N = 55 schools (level 2).

Table 5.2: Bivariate Coefficients for Hierarchical Logistic Models of Gun Carrying

(Model)/Level-2 Variable	?00	?01	*p*	-1s	+1s	Variance
(1) % Black [a]	-4.011	0.248	0.069	0.013	0.024	0.418*
	(0.155)	(0.134)				
(2) Urban school	-4.093	0.517	0.066	0.016	0.027	0.417*
	(0.180)	(0.275)				
(3) Private school	-4.027	0.384	0.470	0.018	0.026	0.441*
	(0.158)	(0.527)				
(4) School size [a]	-3.984	0.000	0.827	0.018	0.018	0.457*
	(0.130)	(0.001)				
(5) Southern school	-4.034	0.071	0.816	0.017	0.019	0.463*
	(0.250)	(0.303)				
(6) PTA participation [a]	-3.997	-0.020	0.877	0.018	0.018	0.454*
	(0.152)	(0.126)				
(7) Student absenteeism	-4.118	0.766	0.008*	0.012	0.021	0.334*
	(0.170)	(0.277)				
(8) Extracurricular inactivity [a]	-3.954	2.727	0.277	0.016	0.022	0.432*
	(0.142)	(2.482)				
(9) Social disorder [a]	-3.973	0.389	0.114	0.015	0.023	0.404*
	(0.147)	(0.242)				
(10) Fearful Students [a]	-3.954	4.263	0.035*	0.014	0.025	0.370*
	(0.142)	(1.970)				
(11) Physically fought [a]	-4.043	5.100	0.012*	0.013	0.023	0.318*
	(0.150)	(1.939)				
(12) Imported disadvantage [a]	-4.027	0.273	0.362	0.015	0.020	0.451*
	(0.160)	(0.297)				
(13) Imported mobility [a]	-3.943	0.799	0.102	0.015	0.024	0.421*
	(0.149)	(0.480)				
(14) Imported violent crime [a]	-3.995	0.071	0.731	0.017	0.019	0.455*
	(0.155)	(0.205)				

NOTE 1: PQL unit-specific models with robust standard errors in parentheses.

NOTE 2: N = 5,129 male students (level 1); N = 55 schools (level 2).

a. Level-2 variable grand-mean centered.

* *p* = .05

Table 5.3: Hierarchical Logistic Regression Models of Gun Carrying with Student Sociodemographic Characteristics

PANEL A

Fixed Effects

Level-1 Variables	*Coeff.*	*S.E.*	*Odds Ratio*	
Intercept, ?$_{00}$	-4.115	0.181	0.016	
Age	0.070	0.186	1.072	
Non-Hispanic Black	0.670	0.401	1.952	
Non-Hispanic Other	-0.115	0.400	0.892	
Hispanic	0.760	0.393	2.138	*
Parent education	-0.130	0.093	0.878	
Single-parent household	0.804	0.317	2.234	*
Random Effects	*Variance*	*S.D.*	c^2	
Level 2, u_{0j}	0.556	0.746	135.051	*
Level 1, r_{ij}	0.643	0.802		

PANEL B

Fixed Effects

(Model)/Level-2 Variable	*Coeff.*	*S.E.*	*Odds Ratio*	Variance	
(1) % Black	0.076	0.170	1.079	0.591	*
(2) Urban school [a]	0.347	0.304	1.415	0.581	*
(3) Private school [a]	0.684	0.509	1.981	0.542	*
(4) School size	0.000	0.000	1.000	0.585	*
(5) Southern school [a]	-0.137	0.374	0.872	0.555	*
(6) PTA participation	0.002	0.147	1.002	0.582	*
(7) Student absenteeism [a]	0.372	0.277	1.450	0.563	*
(8) Extracurricular inactivity	2.045	2.732	7.730	0.581	*
(9) Social disorder	0.298	0.312	1.347	0.559	*
(10) Fearful Students	2.214	2.339	9.155	0.576	*
(11) Physically fought	3.339	2.185	28.185	0.532	*
(12) Imported disadvantage	-0.376	0.393	0.687	0.518	*
(13) Imported mobility	0.306	0.575	1.358	0.584	*
(14) Imported violent crime	-0.255	0.218	0.775	0.533	*

NOTE 1: PQL unit-specific models with robust standard errors.

NOTE 2: N = 5,129 male students (level 1); N = 55 schools (level 2).

a. Level-2 variable *not* centered.

* $p = .05$

Table 5.4: Hierarchical Logistic Regression Models of Gun Carrying with Fully Specified Level-1 Model

Fixed Effects Level-1 Variables	*Coeff.*	*S.E.*	*Odds Ratio*	
Intercept, ?00	-5.714	0.341	0.003	*
Age	-0.035	0.206	0.965	
Non-Hispanic Black	1.014	0.464	2.757	*
Non-Hispanic Other	-0.483	0.739	0.617	
Hispanic	0.531	0.507	1.701	
Parent education	-0.124	0.129	0.883	
Single-parent household	0.440	0.344	1.552	
Parental attachment	0.066	0.049	1.068	
GPA	0.337	0.270	1.400	
School suspension	-0.152	0.390	0.859	
Unexcused absence	0.366	0.299	1.441	
School attachment	-0.045	0.040	0.955	
School fear	0.023	0.158	1.023	
Neighborhood fear	0.620	0.473	1.859	
Weapon victimization	1.673	0.391	5.326	*
Property crime	1.113	0.341	3.043	*
Interpersonal violence	-0.075	0.476	0.927	
Sold drugs	1.267	0.344	3.551	*
Peer drug use	0.142	0.099	1.152	
Depression	0.074	0.039	1.076	
Household handgun	1.018	0.385	2.768	*
Random Effects	*Variance*	*S.D.*	c^2	
Level 2, u_{0j}	1.229	1.109	250.158	*
Level 1, r_{ij}	0.455	0.675		

NOTE 1: PQL unit-specific models with robust standard errors.

NOTE 2: N = 5,129 male students (level 1); N = 55 schools (level 2).

* $p = .05$

Table 6.1: Imported Community Effects on Problem Behaviors

PANEL A (Between-School Variance)

	Handgun Access			Property Crime			Interpersonal Vio.			Sold Drugs			Weapon Victim		
	Var.	S.D.	Sig.	Var.	S.D.	Sig.	Var.	S.D.	Sig.	Var.	S.D.	Sig.	Var.	S.D.	Sig.
Random Effect															
Level 2, u_{0j}	0.385	0.621	*	0.068	0.261	*	0.024	0.155	*	0.299	0.547	*	0.335	0.578	*

PANEL B (Bivariate Effects)

	Handgun Access			Property Crime			Interpersonal Vio.			Sold Drugs			Weapon Victim		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Fixed Effects															
Disadvantage	0.193	0.221		-0.126	0.082		0.165	0.058	*	-0.293	0.169		0.815	0.149	*
Mobility	-0.801	0.411		0.286	0.159		0.212	0.077	*	0.387	0.349		1.039	0.213	*
Violent Crime	-0.273	0.117	*	0.060	0.070		0.000	0.024		0.282	0.137	*	0.355	0.086	*

PANEL C (Fully Specified Level-1 Models)

	Handgun Access			Property Crime			Interpersonal Vio.			Sold Drugs			Weapon Victim		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Fixed Effects															
Disadvantage	0.576	0.260	*	-0.291	0.132	*	-0.063	0.051		-0.595	0.213	*	0.477	0.196	*
Mobility	-0.576	0.456		-0.233	0.163		-0.052	0.039		-0.070	0.422		1.017	0.213	*
Violent Crime	-0.153	0.129		-0.088	0.073		0.000	0.240		0.338	0.175		0.382	0.090	*

* $p = .05$

Appendix A: Survey Items Comprising the Summated Index Variables

Parental Attachment Index (a = .86)

How close do you feel to your mother/father?
How much do you think your mother/father cares about you?
(1=not at all to 5=very much)
Most of the time, your mother/father is warm and loving to you?
You are satisfied with the way your mother/father and you communicate with each other?
Overall, you are satisfied with your relationship with your mother/father?
(1=strongly agree to 5=strongly disagree)

School Attachment Index (a = .73)

Since school started this year, how often have you had trouble getting along with your teachers?
Since school started this year, how often have you had trouble paying attention in school?
(0=everyday to 4=never)
You feel close to people at your school?
You feel like you are a part of your school?
You are happy to be at your school?
The teachers at your school treat students fairly?
(1=strongly disagree to 5=strongly agree)

Interpersonal Violence Index (a = .75)

In the past 12 months, how often did you…

Get into a serious physical fight?
Hurt someone badly enough to need bandages or care from a doctor or nurse?
Take part in a fight where a group of your friends was against another group?
(0=never to 3=five or more times)

Peer Drug Use Index (a = .76)

Of your 3 best friends…

How many smoke at least 1 cigarette a day?
How many drink alcohol at least once a month?
How many use marijuana at least once a month?
(0=no friends to 3=three friends)

Depression Index (a = .84)

How often was each of the following things true during the past week…

Appendix A: (Continued).

You were bothered by things that usual don't bother you?
You felt that you could not shake off the blues, even with help from your family and friends?
You felt depressed?
You thought your life had been a failure?
You were happy?
You felt lonely?
You enjoyed life?
You felt sad?
You felt life was not worth living?
(0=never to 3=most of the time)

Disadvantage Index (a = .78)

Percentage of the population who is Black
Percentage aged 25 and older without high school diploma or equivalent
Percentage of households that is female-headed with no husband present
Percentage of persons who are unemployed
Percentage of persons with income below poverty
Percentage of males never married

Mobility Index (a = .61)

Percentage of occupied housing units that is owner-occupied
Percentage aged 5 and older in the same house as in 1985
Percentage of population foreign born